THE OIL AND GAS JOURNAL

THE OIL INVESTORS' JOURNAL

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MAY OIL EXPORTS.

The total value of 96 per cent of the exports of mineral oils from all ports of the United States during May, as compiled by the department of commerce and labor, was $8,517,158, a gain over the same month of last year of $296,796 and a gain over April of this year of $157,163. The exports of May amounted to 136,363,828 gallons, a loss over the preceding month of 3,475,720 gallons. In May, 1910, 130,326,479 gallons were exported valued at $8,247,362, an increase for May this year of 6,037,349 gallons, in value of $269,769. There was an increase in exports for the month of May over the preceding month in naphtha and illuminating oils, while crude, lubricating, paraffin and residuum showed a decline.

In crude oil 8,813,408 gallons were exported in May, a decrease from the exports of the previous month of 252,784 gallons, with a gain in value of $24,103. In May, 1910, 11,397,476 gallons were exported with a value of $335,444. The shipments for the month were from New York, Philadelphia, Sabine and San Francisco.

During the month of May 12,570,231 gallons of naphtha were exported, with a value of $1,009,755, a gain for May over the preceding month of 1,460,363 gallons and a gain in value of $225,524. In May, 1910, 9,548,981 gallons were exported with a value of $727,563. The bulk of the shipments for the month were from New York, the total from that port being 8,361,629 gallons.

Illuminating oil showed a fair increase for May over April, the total exports amounting to 97,929,820 gallons, valued at $5,501,236. The April figures were 93,249,558 gallons, valued at $5,147,659, an increase for May of 4,680,262 gallons and $353,577. In May, 1910, 85,594,447 gallons were exported, valued at $5,187,860.

There was a decline in the exports of lubricating and paraffin for May from the preceding month, the May figures being 12,266,988 gallons, valued at $1,604,046, compared with 16,788,844 gallons, valued at $1,928,595 for the month of April. The decrease was 4,521,856 gallons and $324,549. In May, 1910, 14,567,167 gallons were exported, valued at $1,709,757. Residuum also showed a decline from April, the May figures being 4,733,381 gallons, valued at $148,279, a loss from April of 4,841,705 gallons and a loss in value of $157,492. The bulk of the shipments for the month were from Sabine. In May, 1910, 9,218,408 gallons were exported, valued at $286,738.

For the eleven months ending May, 1911, the total exports amounted to 1,354,849,130 gallons, valued at $83,377,012, showing a slight gain in the number of gallons exported over the eleven months ending May, 1910, with a slight decrease in value. For the eleven months ending May, 1910, 1,340,235,139 gallons were exported, valued at $86,642,111. For the eleven months ending May, 1909, 1,351,389,775 gallons were exported, valued at $93,231,066.

INVESTMENTS IN MEXICO.

Advices from Mexico indicate that concessions obtained by foreigners during the Diaz regime, will be an object of special attack under the new government. The new governor of Chihuahua has already announced that foreign concessions regarded as monopolies will not be renewed or extended. The Governor says:

"Undoubtedly foreigners, including Americans, who profited so greatly under the Diaz system, will be hard hit by the new era, but the determination to upbuild and to improve the condition of her poverty-stricken people will, I am sure, receive the hearty support of the great body of Americans."

A great amount of money has been invested in Mexico by foreigners and recently Americans have been very active in securing concessions in the oil producing regions. It is now reported that the Pearson interests, controlling the greatest area of oil lands, are arranging for a transfer of their concessions to some American company and press reports indicate that this question is exciting more discussion at the capital than any other following the revolution. The negotations are variously reported as being held with representatives of the Gulf Pipe Line Company and The Texas Company, while Mexicans have been incited to believe that an arrangement with either company would be equivalent to a transfer to the Standard Oil Company. A general and thorough investigation of the Pearson concessions is contemplated and it is quite probable that efforts will be made to prevent any transfer until this investigation is completed.

While it is undoubtedly true that some concessions have been obtained through dealings with politicians, Mexico can ill afford to shut out foreign capital and, in the oil industry noticeably, it will be found that American money and ingenuity alone can assure a steady and profitable development of these natural resources. If the Gulf Pipe Line Company or The Texas Company should secure the concessions it is an assured fact that they would introduce modern American methods into the field operations and the result would be quickly apparent. The cry of "Mexico for the Mexicans" was discounted several years ago, but agitation will certainly lessen the ardor of intending American investors.

TELL THEM THE TRUTH.

Public service corporations, continually at the mercy of inquisitors, investigators and grasping politicians, have a hard row to hoe. Some of them have more than their share of troubles and in some cities the business of corporation baiting seems to be a mania.

Kansas City is a striking example of this fever. Only recently its street car company was forced into receivership by a refusal on the part of the people to renew its franchise. Newspaper agitation, incited more by personal animosity than by a sense of justice to the public, was partially responsible for this action. The company which supplies natural gas to Kansas City is continually hounded and a public utilities commission, which could do good work if actuated by a sense of fairness, is daily urged on to "bring them to time." Last week this commission discovered that the two Kansas Cities will need eighty-eight million feet of gas a day in the coldest day next winter and the company will be called upon to make provision to meet that demand. Officials have been cited to appear and tell their plans for supplying the gas next winter.

Tell them the truth, gentlemen. Tell them what everybody knows, that in order to supply all the gas needed on every cold day in winter it would require a duplication of your present facilities and the revenue will not warrant such an expenditure. Tell them they are mighty lucky to be getting natural gas at thirty cents per thousand and within ten years they would all be willing to pay sixty—even if you guaranteed only three hundred days service—if the natural gas supply failed. Tell them to send the public utilities commission on a jaunt through northwestern Ohio and Indiana, where natural gas was once enjoyed and the ashman is again on the job—a lesson that will be interesting to them and profitable to you. Tell them, finally, to lay in ten tons of coal against the inevitable cold day and go home feeling thankful that it is so long between the Fourth of July and New Years.

WOULD BE AN INTERESTING CASE.

In commenting upon an article reprinted from THE JOURNAL, W. C. Van Hoy, of Independence, Kans., writes an interesting letter to the *Reporter* of that city. Mr. Van Hoy was for a number of years connected with the Interior Department and may be credited with knowing something of the inner workings. He certainly hands the Department officials some left-handed compliments:

The title Acts affecting the lands of the five civilized tribes are intended to grant and do grant to the Secretary of the Interior arbitrary power to approve or refuse to approve the character of leases under consideration, but do not go any further. They give him no power, no authority to meddle with a lease after it has been approved. When he has so acted his power to act has been exhausted and thereafter the case lies entirely between the Indian and the lessee. It is here that the lease contains provisions against assignment without the consent of the secretary of the interior and is expressly made subject to lawful rules and regulations. These conditions are absolutely nugatory and made without authority of law and in attempted extension of the secretary's statutory powers and duties.

The Indians were made citizens of the United States by congressional enactment in the early part of 1901. They are not wards of the government. No government official has the right to handle one penny of their money. Nor can any government official interfere in any wise with their lands, except to approve or refuse to a sale or lease. The Federal court at South McAlester so held in the cases of the United States vs. several thousand persons who had bought Indian lands in the Indian Territory. The court held among other things that the United States is not a proper party plaintiff, and has no legal status as guardian of the Indians, and therefore, dismissed the cases. The holding would be the same, should the secretary try to interfere with the assignment of a lease.

In brief the Indian is a citizen of the United States. He may go into the courts as may any other citizen. His land is burdened with a trust, which runs with the land, and does not attach to the Indian. The producers who have leases, have their remedy. A test case need not cost much per operator. An assessment of a small sum on each member of the Mid-Continent Association will pay all costs and attorney's fees and forever put a quietus on the secretary and his clerks.

A little history may not be uninteresting. Before the various Allotment Acts were passed, congress provided for the leasing of coal and asphalt lands in the Choctaw and Chickasaw nations and gave the secretary plenary powers. The land was the tribal land, held by a community title, and the Indians had not been made citizens. When the acts under discussion became laws, the secretary, Mr. Hitchcock, not a lawyer, insisted on applying the same and more stringent rules and regulations. Many of his clerks are good lawyers, but he was the head of the department and must be obeyed or place a few heads in the basket. He was obeyed. He believed that the Indian's Rights Association—composed of a few superannuated preachers and Philadelphia maiden ladies who meant no harm and couldn't afford a dog on which to waste their idle time—knew more about Indians and Indian matters than all others combined. They told him that the old theory that the good Indians were all dead, was a base defamation and that Kit Carson and Generals Freemont and Miles were slanderous, libelous wretches. They painted a more harrowing picture of the halo-crowned Indian, whose bonds were being torn from their bellies by the human buzzards in the form and disguise of oil men than the pre-war correspondent painted of the starving and patriotic Cuban reconcentradoes and their fiendish Spanish tormentors.

Mr. Hitchcock, honest, simple-minded, good Christian head of the Glass Trust, told the boys to send a few screws into the oil men every morning. The boys did it. What did they care or know about oil and operations or oil men?

None of them knew a bull wheel from a box of five gross assorted hat boxes. They talked about digging an oil well and supposed it was done with a spade, shovel and two Irish terriers.

This history is thrown in merely to show the oil man that he is not dealing with men of super-transcendent knowledge, intelligence and independence when he goes to the Indian officer at Washington, hat off, and humbly asks "Mr. Man of Great-ness, may I venture to speak before you."

Let's have a test case. We will have it sooner or later. It is bound to be. The sooner over, the sooner will producers be in positon to sell leases and deal as men—not as children.

Any move that would make some of the Washington officials treat the oil producer with the consideration he deserves would be most welcome. Arbitrary rulings, such as these officials have always made, are the chief deterrent to progress of the business in the Mid-Continent field and California is now being made to suffer also. We are constrained to believe that the description Mr. Van Hoy gives of the official group is not overdrawn.

The attorney general of Kansas is hard up. However, at present it don't appear to worry him. While the litigation against the Standard Oil Company and subsidiaries was in progress, an agreement was made between the attorney general and counsel for the company whereby a stipulated amount was to be paid into the school funds of several counties in the state in case the court decided against the Standard. Costs of approximately twenty-five thousand dollars were also to be paid by the defendant. The decision was rendered June 8 and on June 16 the Standard attorneys, at the request of the attorney general, paid one thousand dollars on account. The attorney general announced that his contingent fund was depleted and the Standard's payment allows him to continue prosecution of the prohibitory law violators. Score one, at least, for the S. O.

The Secretary of the Interior has notified Mid-Continent oil producers that a hearing will be held at Washington next Monday, at which lease regulations will be discussed and any suggestions for change considered. This evidently opens up a wide field for producers and it is hoped that there will be a large attendance at the hearing. The new Secretary has started to follow in the lines of his predecessors, but if producers will get together and show him what they consider is for the best interest of all concerned, it is possible that he may be prevailed upon to adopt less drastic measures. From the tenor of the telegram announcing the hearing, there is evidently little to be hoped for, but strong representations from the men who know the business and its drawbacks, may have a tendency to restrict adverse action.

A bulletin of interest to oil refiners has been issued by the United States geological survey, covering the production of fuller's earth in 1910. Jefferson Middleton is the author and he has prepared complete statistics on the industry. Fuller's earth was first discovered in Florida in 1893 and during the past year 32,822 tons were produced in various states of the Union. Still, the price has gradually increased from $6 in 1895 to $8.95 in 1910.

Petroleum operations in China come under the supervision of the Board of Commerce and some of the restrictions imposed would put our Interior Department officials to shame. As a starter, the government collects a tax of seven and one-half per cent on the gross output. At present, the proceeds from the tax, paid in Chinese coin, would not burden a ten-year-old boy.

In this issue THE JOURNAL concludes publication of the official record of the Pittsburg convention, Natural Gas Association of America. It is rather unusual that these proceedings are published complete within one month after the convention, but many of the matters under discussion are of such interest that the full publication will undoubtedly be appreciated.

This is really a new one. The Chamber of Commerce of Savannah, Ga., "in keeping with the initiative policy" makes a bid for the state headquarters of the Standard Oil Company, upon the assumption that the reorganization will compel the establishment of a headquarters in every state where the company has done business.

As noted in our news columns, a number of wells are being drilled in various parts of Missouri and as we are domiciled in the "show me" state, here's hoping some of them are successful. At present there is no production of oil in this state and very few producing gas wells.

Why shouldn't an oil farmer have a 20 per cent ad valorem tariff as well as a sheep farmer? Petroleum is a warmth-giving product the same as wool. The tariff is a bogie, of course, but it ought to treat all producers alike.

TRADE NOTES

The Standard Oil Company is constructing a 24,000-barrel tank adjoining its works on Harmon street, Savannah, Ga. Savannah will probably be made the main distributing point for the state.

The Texas Company has secured the approval by the Secretary of State of Texas of sixty certified copies of its articles of incorporation to enable its operation in every state in the union and foreign countries.

The Standard Oil Company will make improvements in its plant at Americus, Ga., a site having been purchased for $15,000 at Lozano and Hillsboro streets. A warehouse, offices and six storage tanks are to be constructed.

In a petition recently filed with the city commission of Dallas, Tex., it has been asked to sprinkle with oil Austin street and Ross avenue. The petition was signed by practically all the property owners in the immediate vicinity.

The city council of Wilmington, O., has made a contract with E. W. Leight, of the Pennsylvania Oil Company, of Middletown, O., to furnish 10,000 gallons of crude oil to be applied to the streets. The contract price is 4½ cents, applied.

The plant of the Sapulpa Refining Company, at Sapulpa, Okla., was partially destroyed by fire this week, the loss being estimated at $100,000. Lightning struck the tanks and several were burned, spreading the fire to the main works.

The highway department of Allentown, Pa., is distributing oil on the most traveled highways in that section of the city where macadamized roads prevail. An order has been given for another large consignment of oil, and the good work will continue.

Gilbert L. Watson has been elected president of the Citizens National Bank of Parkersburg, W. Va., to fill the vacancy caused by the death of the late Charles H. Shattuck. Mr. Watson is a well known business man and has been a successful oil operator for years.

The Robinson oil refinery, of Robinson, Ill., which has been idle for several months on account of financial troubles, has been sold to a stock company, known as the Wabash Refining Company. The new concern is headed by capitalists from Columbus, O., and the plant has started up again.

A CALIFORNIA GUSHER.

A report from an American consul in Canada states that a business house in his district is anxious to receive tenders for 20,000 gallons of the best illuminating petroleum, packed in cases. Prices should be quoted f. o. b. The address can be had by applying to the Bureau of Manufactures, Washington, D. C. File No. 6878.

Commissioner Briggs, of the board of public works at Milwaukee, Wis., has purchased 300,000 gallons of asphaltum oil, to be used on the streets, at the net price of .0305 per gallon. The specifications provided for the oil to contain 15 per cent more asphaltum than was in the oil sprayed over the streets last year.

The International Steam Pump Company, of 115 Broadway, New York, has recently issued two bulletins dealing with centrifugal pumps. One is entitled Worthington Type D Centrifugal Pumps and the other Worthington Centrifugal House and Sump Pumps. They are gotten up in good shape, being well illustrated, with full directions for installing and operating.

Mr. William Whyte, vice-president of the Canadian Pacific railroad in the west, has announced that crude oil will probably be used shortly as fuel on all the Canadian Pacific trains running through the Rocky Mountains. He recently stated that he would recommend the use of oil for fuel for the entire distance through the mountains in order to remove the forest fire hazard.

It is reported that the Standard Oil Company will erect a ten-story office building at the northwest corner of Sansome and Bush streets, San Francisco, to be used as the Pacific Coast headquarters of the corporation. The property purchased embraces the old First National bank site and adjoining parcels, the total sum paid being $350,000. Plans for the new building have been made by Benjamin G. McDougal.

A majority of the state land board of Colorado voted to grant to Fred P. Davy, for the Mesa Verde Oil Company, a lease for ten years on 5,200 acres, being almost the entirety of the state's oil lands on the south side of McElmo canyon. The grant was fought as giving the company a monopoly on state oil lands. A compromise was effected whereby the Mesa Verde Company gets a lease on 2,600 acres in alternate tracts of 40 acres each.

Consul General R. M. Bartleman, of Buenos Aires, has forwarded specifications and blue prints to the Bureau of Manufactures, Washington, D. C., inviting tenders for 14 drilling machines. The blue prints can be obtained upon application to the bureau. Tenders will be received at the Division of Mines, Geology and Hydrology, Department of the Ministry of Agriculture, Calle Maipu 1241, Buenos Aires, until August 31, 1911. File No. 6871.

The Norfolk Southern railroad, beginning June 18, will operate specially between Berkley ward of Norfolk and Virginia Beach its new gasoline motor car, which is operated on the Munden's Point division. Several roads are putting on gasoline motor cars, and the results are in most cases satisfactory. While they are used on short runs, they will probably reach such a point of efficiency in time that they will be considered a factor in transportation.

The Southern Pacific railroad is conducting a series of tests for the use of lignite for fuel in its locomotives. It is claimed that the cost of lignite is considerably less than fuel oil, and as there are large deposits in Texas, if the tests prove successful, it may be used on the southern divisions. The experiments are being conducted with a new burner that was especially constructed for the purpose and installed upon one of its largest locomotives.

Thirteen tank cars have been received at Everett, Wash., by the Great Northern railroad to carry fuel oil from the storing station at Everett to the various points on the Cascade division, where the locomotives of the division begin using fuel oil this week. Four storage tanks, each to hold 45,000 gallons of crude, are under construction at Everett and another of the same capacity is being erected at Delta, to care for engines at that point. The entire division will probably be using oil by the middle of July.

A report from an American consul states that a degree has just been issued by the President of a Latin-American Republic authorizing the local government to purchase three well-drilling machines and to employ competent men to operate them. The machines and operatives are to be rented to farmers at a fixed rate, for the purpose of increasing the number of artesian wells in the rural districts. Several machines manufactured in the United States are already in use in the country. Information can be had by addressing the Bureau of Manufactures, Washington, D. C. File No. 6640.

V. B. Archer, of Parkersburg, W. Va., has issued a book on law and practice in oil and gas cases, embracing an analysis of all-important cases in each state producing petroleum and natural gas, including the decisions of the Federal courts; also an analysis of each case showing the law of the case and the facts and pleadings from which the court deduced its conclusions. The practice in oil and gas cases is dealt with at length and citations of cases are made from all parts of the country. The book contains over 1,000 pages and is full of valuable information. It is for sale by the W. H. Anderson Company, Cincinnati, O.

A mortgage was filed for record in the county clerk's office at Beaumont by the Magnolia Petroleum Company to the Columbia Trust Company of New York, to secure bonds in the sum of $3,500,000. The bonds are in the sum of $1.000 or multiple thereof and are due April 24, 1936. The Magnolia Petroleum Company is the successor of the Security Oil Company of Beaumont and the Navarro Refining Company of Corsicana, both of which were ejected from the State for the violation of the anti-trust laws and when sold by the State's receiver were purchased by the John Sealy Company of Galveston and subsequently passed to the Magnolia Petroleum Company.

James A. Quinn, city oil inspector of Chicago, in his last monthly report to the city council, showed that a net revenue over expenses of $3,003.88 was turned into the city treasury for the month ending June 1. Heretofore the oil inspector has kept all fees in this department. The present administration had the office made a salaried one by a senate bill, which required that

all fees be turned into the city. The total number of barrels of oil, gasoline and naphtha inspected was 67,926, which at the rate of six cents per barrel, brought a revenue of $4,075.56 to the city. Salaries and other expenses amounted to $1,071.68, leaving a net revenue of $3,003.88.

PERSONAL MENTION

Tim Spellacy will leave Los Angeles this week for Mexico in the interest of the Mexican Premier Oil Company.

Mr. and Mrs. R. G. Lamberton have departed from Bartlesville, Okla., to spend the summer with relatives at Franklin, Pa.

C. K. Brown, an old-time operator, has moved his family from Marietta to Akron, O. He will leave in a few days for Oklahoma and Texas where he has large interests.

Jim Carpenter, who has had charge of the Greene & Hutchinson lease in Elk Hills, Cal., is en route to New York to visit his family. Mr. Carpenter will make a circuit through the oil fields of Mexico before returning to California.

Don Baxter, of Lima, O., is returning to his home in the East after a sojourn of several weeks in the California field. He has secured a nice acreage in the Fullerton field, and with associates will begin development work in the near future.

G. G. Martin, attorney at law and oil producer was married last week at Bartlesville, Okla., to Miss Florence Black. Mr. Martin is of the firm of Martin, Blue and Breene, with offices in Bartlesville.

Judge John J. Shea, of Bartlesville, Okla., has gone to Texas on a short trip, looking over the situation around Electra. Mr. Shea has made good in the oil business and takes a keen interest in any new developments.

Victor A. Hays, auditor of the Kansas Natural Gas Company, at Independence, Kan., has been making one of his periodical visits to the company's office at Pittsburg. C. S. James, treasurer, accompanied him on his return to Independence.

Sam E. Bell, who is interested in leases near Dewey, Okla., is visiting with his family in the east. Mr. Bell has only been in the Oklahoma field a few months but is favorably impressed with the country and will probably make his home in Bartlesville in the near future.

W. R. McCormick, who was a well known druggist in Shamburg, Pa., when the towns along Oil Creek were in their prime, is still engaged in active business, having offices in the Citizens Bank building, Los Angeles, Cal., where he is handling real estate and investments.

Allen G. Nichols, president of the United Oil Company of Mexico, will leave Los Angeles soon for a several weeks' trip in the Mexican oil fields. Mr. Nichols recently compiled and published a report of investigations made in that country, and the report is instructive.

John Markham, accompanied by his wife has departed for Chicago and intends to spend the summer in a cooler climate than Oklahoma. He made the trip to Kansas City in his machine in twelve hours, accompanied by D. J. Kelly, and thought he was going some.

J. S. Connelly, of Carthage, Mo., was a caller at THE JOURNAL office this week. Mr. Connelly is interested in a number of distributing gas companies in Missouri, Kansas, Arkansas and Oklahoma. He started at Titusville and has followed the business through its palmy days down to the southland.

John J. Larkin, of the Larkin Bros. Company, Bartlesville, Okla., stopped off in St. Louis on his return from Michigan. Mrs. Larkin and the children will spend the summer at Grand Haven. John and Frank are sons of "Billy" Larkin, packer expert of Butler, Pa., and in the early days of the Oklahoma excitement they set up shop in Bartlesville, where they have built up a splendid business

J. H. Mason, vice president of the B. F. Goodrich Rubber Company, of Akron, O., is one of the recent subscribers to THE JOURNAL. Mr. Mason was an active operator in the palmy days of Fagundus and Tidioute, but retired from the game and turned his attention to the rubber business. The Goodrich company is the largest of its kind in the United States, employing about 5,000 men. While Mr. Mason is not engaged in development work, he takes an interest in oil field events.

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ST. LOUIS, MISSOURI

A. P. Dyke, of Hope, Ark., was a St. Louis visitor this week, after a trip to Illinois, where he was looking up some drilling tools. Mr. Dyke has been interested in the possible development of oil property in Arkansas for a number of years and has faith in the prospects for that state. At present he is working with V. B. Wilson, president of the First National Bank, Stromsburg, Neb., and associates, on a well at Gurdon. They drilled 1,100 feet with a rotary but have decided to add cable tools and will make such arrangements at once.

IN THE COURTS

Arch H. Peterson has filed suit at Tulsa, Okla., against the Keystone Oil and Gas Company for damages to the extent of $8,900 for injury sustained while working on the company's lease near Kiefer last April.

The Prairie Oil and Gas Company is defendant in a suit filed at Tulsa, Okla., by T. M. Triplett, who asks $5,000 damages. Triplett alleges that, while working on a pipe line, he was injured by the falling of a heavy joint of pipe and his injuries should entitle him to the amount asked.

The United States Circuit Court at Wilmington, Del., Wednesday handed down a decision declaring the powder trust, dominated by E. I. Dupont De Nemours Company, a combination in restraint of interstate commerce. On October 16, a hearing will be held to consider a plan for dissolving the combination. The court took into consideration the fact that the government is buying military and ordnance powders and explosives for use in Panama from the trust and for this reason would delay dissolution until the companies affairs can be arranged.

In the suit of J. M. Holloway vs. the Standard Oil Company et al, at Los Angeles, in which the plaintiff claimed a seven-sixteenth interest in land, while his associates, the Big Four Oil Company and others claimed his interest was but four-sixteenths, has been settled, Mr. Holloway accepting a settlement under the latter terms. The land was in section 30-32-24 Midway, and was sold to the Standard Oil Company more than two years ago for $250 per acre. Several good wells were drilled on the property and Mr. Holloway's share of the proceeds amounts to $40,000.

Nathan B. Groff, a creditor of the Federal Oil and Development Company, filed a petition in the superior court at Indianapolis, asking the court to remove William L. Treaser as receiver, alleging that the receiver is a resident of Texas and not within the immediate jurisdiction of the court. Mr. Groff alleges that the receiver has done nothing within the last two years toward winding up the company's affairs, and that on account of his place of residence he is not in a position to bring and prosecute suits against stockholders of the concern on stockholders' liabilities. It is further alleged that the receiver has allowed a large amount of litigation to stand against the company.

Suit against the Standard Oil Company on five counts charging restraint of trade and shutting out competition in Dickinson county, Kan., in violation of the state statutes, was filed in the district court at Abilene, June 16, by State Attorney Dawson and County Attorney Rugh. The suits are based on the anti-trust laws of the state and are for the purpose of collecting penalties for violation. Suits against this company have also been filed in Franklin, Reno, Cowley, Finney and Leavenworth counties. The attorney general did not give out the number of suits to be filed, but it is probable there will be 20 or 30. The reason the total to be collected is not brought in one suit is that the attorney general wants to divide the penalties collected among the counties in which evidence was obtained in the Standard Oil anti-trust suits. The money goes into the school fund.

A petition has been filed in the district court at Nowata, Okla., for the recovery of the allotment of Sarah Johnson, a Cherokee freewoman. It appears that the Knickerbocker Oil Company, of Nowata, held a lease on her property, which was executed by Moses Johnson, the girl's father and guardian, on which was located some good producing wells. It is claimed that about the time the minor lease was to expire, Sill, Sawyer and Branson, of Nowata, said to be interested in the Knickerbocker company, formulated a plan to obtain possession of the property, and a petition was made to have the land sold. It was sworn to by Moses Johnson, in which it set forth that Sarah Johnson was threatened with tuberculosis and needed money to effect a cure. The property was advertised and sold by Judge Jackson of Muskogee, for $500. It is claimed that the royalty interest alone was $200 a month. The petition asks that the sale be set aside because of the fraud practiced and the property restored to Sarah Johnson, who is now of age.

State Mineralogist Aubury, of California, says that a number of letters have been received lately from the East in all of which complaints have been by purchasers of stock from James E. Kerr, and the evidence is sufficient to show that he is using the mails actively in other parts of the country, although his operations have been interfered with largely by Aubury's expose of his methods in California. Mr. Aubury says that he intends to make a showing relating to Kerr's operations that no one may claim that the state of California has not manifested due diligence in protecting its good name and giving assurance of good faith that shall strengthen confidence everywhere in the solidity of California investments and prevent it from being destroyed by men of the Kerr type. Kerr has promoted the following companies: High Gravity, $2,000,000; American Duchess Oil Company, $2,000,000; Illinois Oil Bond Company, $2,000,000; Paxton Gold Bond Oil Company, $500,000; Wisconsin Gold and Oil Company, $1,000,000; Debenture Surety Company, Queen Regent Copper and Gold Company, Bullfrog Extension Mining Company, Bullfrog Big C Mining Company, capitalized at $1,000,000.

GOD OF WAR OF THE HUASTECAS
An Idol in the Plaza at Amatlan Which Will Become a Familiar Sight to Visitors in the Mexican Oil Fields.

In the case of B. H. Barton et al. vs. J. M. Guffey Petroleum Company et al, at a hearing before Judge Hightower June 17, at Beaumont, Tex., the court ruled in favor of the plaintiffs and ordered that permanent writs of injunction issue, restraining the defendants from permitting salt water or waste oil flowing from the Spindletop oil field into Hillebrandt's bayou. The injunction restrains specifically the following named companies and individuals operating in the Spindletop field: J. M. Guffey Petroleum Company, Unity Oil Company, the Sun Company, Sunshine Oil Company, Right-of-Way Oil Company, Underwood Nazro, Ras Landry, L. F. Beckenstein, Arthur McReynolds, W. D. Gordon, R. S. Thompson, J. C. Wilson, John W. Henderson, R. W. Wilson, J. R. Caston, Monroe Carroll, J. B. Moore, W. G. Taliaferro, Jack Taliaferro, J. M. Thresher, Gray Oil Company, G. B. Speed, W. B. Derr, Jesse Moore, Fred Hunter, Casey Oil Company, Wilson & Brooch Oil Company, Stella Oil Company, Gray & Lanham, William Wiess, J. M. McCauley, Lowry Bros., Joe Phelps, William Wagner, L. Sneed, E. K. Failor and S. F. Stollenwerck, and the injunction also applies to all others operating in the Spindletop field, or who may in the future operate in the field. The injunction is effective from March 1 to September 1 of each year, this being the season in which the water is used in the bayou by the farmers for irrigating their rice crops. In the case of T. H. Garner et al vs. Right-of-way Oil Company, in which the officers were cited to appear and show cause why they should not be adjudged in contempt of court for a previous violation of the court's order restraining them from allowing salt water and waste oil to run into the bayou, the hearing was passed over and will be taken up by agreement later.

RECENT DEATHS

Daniel J. Corkery, aged 62 years, died at his home, 259 Broadway, Bayonne, N. J., June 14. He ran the first oil still erected in Bayonne 35 years ago by the Lombard and Ayers Company, which later merged with the Standard Oil Company. He is survived by his widow and two children.

D. W. Murphy, one of the best known operators in the Ohio field, died suddenly at his home in Toledo, June 11, of heart trouble. Mr. Murphy was an old time Eastern operator having been identified with the businss for the past 35 years. He has been a resident of Toledo for the past eighteen years. He is survived by a widow and three children.

Robert George, Sr., died at his home at No. 65 Jackson Avenue, Bradford, Pa., June 15, from ills which had afflicted him since August of last year Mr. George was born in Glasgow, Scotland, January 21, 1849. He became identified with the petroleum industry in the early seventies, and soon became a producer, having been successful at that calling. He is survived by his widow, one son, Robert George Jr., of Bradford; a brother, James A. George, of Montrose, Scotland and two sisters, Mrs. A. Kerr and Mrs. Helen White, both of Glasgow, Scotland.

William E. Cribbs, aged 22 years, died at the home of his brother in Fostoria, O., last week from pleurisy. For many years his parents resided at Bradner, O., where his father, now deceased, was heavily engaged in the oil business. Deceased was born at Clarion, Pa., November 11, 1889, and was employed as a reporter on the Toledo Times. He is survived by his mother; his widow, residing at Martinsville, Ill.; H. T. Cribbs, Fostoria, O.; Frank B. Raymond, Harold and Arthur E. Cribbs, of Martinsville, Ill., and one sister, Mrs. Claud Welliver, of Fremont, O.

John Martin, aged 74 years, died at his home at Westfield, Tioga county, Pa., June 14. The deceased was born at Tarentum September 9, 1837. His early years were spent in and around Tarentum, but when oil was discovered he entered the business and drilled one of the first wells in the neighborhood of Marietta, O. After completing this work he went to the Tarr farm on Oil creek, and in 1873 entered the service of the old Karns Pipe Line Company in Butler county. After being employed by this company for several years he went with the Tidewater Pipe Line Company and worked at various stations for the company for 20 years.

Miss Minnie Cornelia McReynolds, aged 16 years, 1 month and 16 days, died at the home of her parents in Beaumont, Texas, last Friday morning, June 16, from burns received in an oil fire at Vinton on Tuesday night, June 13, an account of which appeared in the June 15 issue of THE JOURNAL. For a while it was thought Miss McReynolds would recover from her injuries but the burns were so severe that recovery was impossible. Miss McReynolds was born in Sabine Pass, Tex., but had spent most of her life in Beaumont, where her father had been for a number of years in public life and lately had given most of his time to looking after his oil business at Spindletop and Vinton. She was a very brilliant young lady and gave great promise for the future and her death was a decided shock to the people of Beaumont. Besides the bereaved father and mother, Mr. and Mrs. R. A. McReynolds, she is survived by a sister, Miss Miriam McReynolds and a brother, Felix McReynolds.

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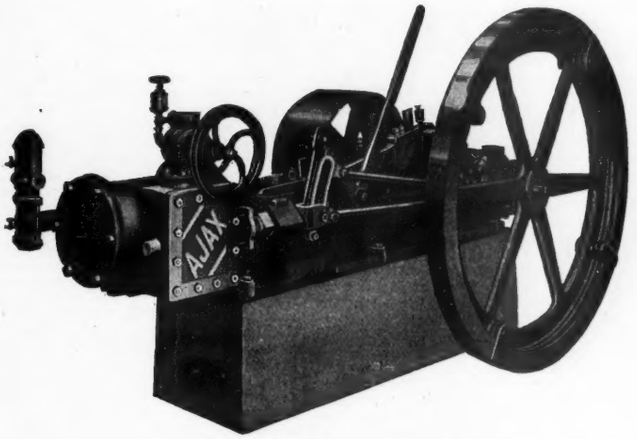

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MID-CONTINENT FIELDS

OKLAHOMA, KANSAS,
NORTHWESTERN LOUISIANA,
NORTH TEXAS

OKLAHOMA FIELD QUIET.

Lack of Water Shuts Down Wells. Another Conference at Washington.

TULSA, Okla., June 21.—(Special.)—The raise of two cents in the price of oil by the three principal buyers in the Oklahoma field last week may stimulate operations to some extent, but what is needed most at the present time is a good rain, as the country is about drying up. For several weeks rain has been a scarce article in Oklahoma, and although conditions are improved to some extent by the increase in price, tools are shut down in all parts of the field and the scarcity of water is having its effect in the operation of leases. Oklahoma has been experiencing drouths the last year which have curtailed operations to a very noticeable extent, and although the output of all fields is being handled in first class shape by the pipe lines, the decline in new work can be attributed more to the lack of water than marketing conditions. It is doubtful if any field has been as well taken care of as the Oklahoma districts, the problem of storage and market having little to do with general conditions While few extensions have been made to the old producing districts, the production is being held up and numerous wells are drilling within defined limits. Rumors of large deals in leases are still being circulated, although the only one that has taken shape where it looks as though a transfer of property is to be made is the Morton-Campbell deal. It is said that the papers for the transfer of the property are being examined by a Kansas City law firm, and that the deal will be consummated in the near future. There are some defects in the titles which may delay the final transfer for a while. The Price-Waterhouse company of accountants have been working on the books at Bartlesville for some time.

Will Hold Conference.

Notice has been sent out by the commissioner of Indian affairs that there will be a hearing at the office of the first assistant secretary of the interior at 11 o'clock on Monday, June 26, to consider approving pending oil and gas leases, to limit the time of operation of said leases to 15 years and to consider requiring lessees to serve notice within the first year of a desire to terminate the lease or be compelled to pay one dollar per acre unless the lease is surrendered and to consider changing regulations according to any other suggestions which may be made at such meeting. E. R. Perry, president of the Mid-Continent Oil and Gas Producers Association will head a delegation from Oklahoma and will be on deck to protest against any new regulations affecting the industry. The lease question on Indian lands in the territory has been a complexing one, and each new official has a separate set of rules which he wishes to put into effect. The question of approving the assignment of leases has been a blow to operators, especially those who have made deals and have been held up by the department. Transfers of property made almost a year ago have not been confirmed by the interior department, and those interested in the deals have had to suffer. Just what the department's object is in resorting to dilatory tactics is not known but it is working a hardship on producers. The question of the time the leases were to run was supposed to have been settled when under the Roosevelt administration the clause was inserted that the property could be operated as long as oil or gas was found in paying quantities. Departmental changes have been numerous and the matter of changing regulations to suit any other suggestions will leave a wide field for argument.

The Osage Pool.

Nothing of especial interest has developed in the Osage pool during the past week, although a number of wells are drilling. The Barnsdall well in section 1-20-8 is due. Trouble is being experienced at 2,396 feet but it is expected that it will be finished up within a few days. Moore & Braden's test in section 12-21-8, north of the Northwestern Oil Company's lease struck a vein of gas at 1,750 feet and it caused a little excitement. The casing was raised several feet. The sand should be reached in a few days. This test is located in the center of the south line of the north half of the section. The Barnsdall test a half mile north is not yet in. The Barnsdall Oil Company has started a well about three miles southeast of Wynona, north of Osage Junction, located in section 24-25-9. Two miles north of the dry hole drilled in section 14-21-9 the Finance Oil Company will drill another test in the hope of finding a pool.

In the old portion of the pool the Barnsdall Oil Company is drilling No. 17 in section 2-21-8 and up north in section 1-21-8 the same company's test will be drilled in the first of the week. It is now down 2,175 feet. The Barnsdall company has been curtailing operations in the Osage, having only two strings of tools running. No. 1 in section 18-21-8 was a duster. The Finance Oil Company is casing No. 9 which has been causing so much trouble the past couple of months and is fishing in No. 23. No. 8 of the Northwestern Oil Company is drilling at 800 feet and No. 9 is 500 feet and Nos. 10 and 11 are rigs. A rig is about completed for No. 12.

The Indian Territory Illuminating Company's test on Lot 78, about a mile and a half south of production is not as good as at first reported. It had a small showing in the Bartlesville sand, and will be drilled to the Mississippi lime. The Illuminating company is drilling for gas and if it is a producer the oil will go to W. C. McBride, of St. Louis. The well on Lot 293 is now making about 350 bbls. a day. The Indian Territory Illuminating Company has a clause in its leases which reserves to it the marketable gas found in wells, and is increasing its supply.

In Pawnee County.

The second test of the Prairie Oil and Gas Company on the Skinner land section 10-20-8 is a fair gasser and the gas is being used at the Prairie Oil and Gas Company's station across the river. John Markham is down 1,000 feet in his test on the E. G. Findley land, section 35-21-8, offsetting the Minnehoma well on the Michaels. The Minnehoma is drilling No. 2 on the property. The Gypsy Oil Company is shut down for water in its well in section 36-21-8. Barney Rabinovitz is down 600 feet in his test in section 6-20-9. The S. R. K. Company will drill an offset to the Selby well and the Minnehoma will drill location No. 3. The Milliken Oil Company has made a location for No. 7 on the Gibbons land in the southwest corner of the north half of the northeast quarter of section 10-20-8. The Reese Oil Company has a duster in No. 5 on the Warren land, a location east of the banner well in the Cleveland pool. The second well of the Milliken company on the Craig which had a light showing was shot and made 500 bbls. The Mullendro & Blake test in section 2-20-8 is dry.

Quiet at Wagoner.

There is little developing in the Wagoner field to cause any excitement, although land in that neighborhood is still being boomed. The results of late tests have not been any too encouraging and with the brace of dusters that have come in lately it is questionable whether a field will be developed. Yoke and Culbertson are due with a well in section 6-18-19 several miles from the Gammon lease, on which the No. 4 was dry. Barnes & Mallory are drilling their test deeper in section 13-18-17. McCray & Wrightsman will shoot their test in section 6-17-18, offsetting the first well on the Gammon lease. French and associates are due with an offset to No. 3 Gammon in section 36-18-17.

Fair One at Morris.

The test on the Hattie Scott land, section 23-13-14, will make 100 bbls. at 32 feet in the sand. The Producers test on the Thornburg land, section 29-14-13 has reached the gas sand at 1,595 feet with a good showing.

Drilling for Gas.

The Oklahoma Natural Gas Company is drilling northeast of Bristow for the 950-foot gas sand and is down 750 feet on the Henry Self land, section 30-17-10. The company has built a large pump station at Kelleyville and the output of the wells will be used as fast as drilled in. The last well drilled on the Self land made 1,800,000 cubic feet. The Producers Oil Company will finish up its well in section 26-18-10 this week if no bad luck is encountered. The Kelly well on the Annie Brummett allotment should also be in this week.

Drilling to the East.

Ray Collins and associates are still drilling in section 18-17-11. The well was dry at 2,450 feet but is being drilled deeper. Several wells are drilling in the field and an extension is looked for between the Dutcher pool and the country to the west and north. The Nina Oil Company is spudding in its test in section 2-15-9 in the southeast corner of the section. The gasser which supplies the town of Bristow is located in the northwest corner of the same section.

Shallow Sand Wells.

Up in the Dewey and Hogshooter districts work is going on at about the usual rate, although the scarcity of water is retarding operations to some extent. The Central Fuel Oil Company was an active operator there some time ago, but has only a few strings of tools running at present.

In the Delaware pool there are very few strings of tools running, although a few months ago it was the busiest place in the Oklahoma field. The production is steady and a number of operators are cleaning out their wells.

Drilling at Blackburn.

The Prairie Oil and Gas Company is shut down for water at 850 feet in its test at Blackburn. Work has been delayed for some time, but it is thought that drilling will be resumed as soon as water is available.

CADDO PRODUCTION UP.

Harrell Well Largest in Field. Standard Raises Price.

SHREVEPORT, La., June 20.—(Special)—For the first time in many months the production of the Caddo fields has assumed a respectable figure when the cost of operating is considered and as in all former cases when the production was large, it was due to two wells. The Producers Oil Company Nos. 16 Levee Board and Harrell 7, in the Monterey district, are credited with nearly 40,000 bbls. between them, the Harrell well showing from 25,000 bbls., easily the largest well yet brought in. Unfortunately, the pipe line facilities are inadequate to handle all the oil and both wells are shut in from time to time and are not flowing all their production. The Louisiana Company is laying an eight-inch line but it will be some time before it will be completed and in the meantime, unless some of the other pipe line companies are given some of the oil to run, it will be some time before the wells can be opened to their full capacity. The Harrell well's production is all the more remarkable when it is considered that this well was on fire for over three weeks, several hundred thousand barrels of oil being consumed. As a rule the gushers in the field have been short lived and the fact that this well is now over five weeks old and as strong as ever, is one of the most encouraging features of the field. The well on the Levee Board lease, is flowing strongly and although about one-half of the output is water, the well is credited with at least 15,000 bbls. of good oil. The oil has to be treated and on account of the high gravity, the Harrell well showing 44.5, the highest found in the field, it is not advisable to turn it into earthen storage, so the well has to be shut in.

The Producers Oil Company's No. 6 Harrell, the discovery well in this district, which quit when the Levee well came back, again flowed last week for several days at the rate of 800 bbls., and was shut in on account of the company not being able to handle the oil.

Standard Completes Another Gusher.

Barry No. 1 of the Standard Oil Company, in section 11-20-16, which flowed for a while at the rate of 7,000 bbls. and is now holding steadily at 3,000 bbls., was the principal item of interest for the week. The well was washed last Tuesday and came in a dry gasser but blowed out and at 4 o'clock Wednesday morning came in on oil and gradually got stronger until 3 o'clock in the afternoon when it reached its best figure. The well is on the land known as the Rudersdorf, and is southeast from the Producers former gusher on the Atlanta and is near the Standard's former big well on the Hardy land.

Other Completions.

The Standard Oil Company is bailing White No. 1, in section 2-20-16, the well lackng gas to flow and will make a pumper. The Barnes Oil Company's second test on the Kuhn land in section 10-20-16, is flowing by heads and will make a small well The first well of this company was a 1,500-bbl. producer. The Producers Oil Company is bailing No. 3 Evans, in section 11-20-16, the well showing lots of oil but lacks the gas to flow. It will make a good pumper. The Higgins Oil and Fuel Company completed No. 1 Schultis, in section 9-21-16, spraying about 100 bbls. and a string of small pipe will be run in to try and make it flow. The Standard's offset to this well, Helpman No. 8, is dry at 2,340 feet and will be deepened.

The Shallow Sand

The Busch-Everett Company opened No. 1 Edwards in the Vivian district last week, the well flowing 250 bbls. The Vivian Oil Company missed the oils and in Nos. 4 fee and 4 Levee Board, both wells making gas, and Sutherlin No. 2 an offset to the Barker well, won't flow and it may be several days before it comes in.

Standard Raises Price.

The Standard Oil Company again raised the price of light oil, 38° gravity and over bringing 60 cents, an increase of 5 cents. The raise was posted Wednesday, June 14, and has been met by the other companies. The price of heavy oil remains at 50 cents. Prior to the posting of the last advance, the light oil was required to be 40° and over but the gravity has now been lowered 2°.

The second test of McCormack & Snyder at Naborton, after an excellent gas showing last week, failed to find any oil immediately below and the hole is now below 1,000 feet in chalk. The gas was found at 820 feet and has a strong petroleum odor and it was thought that a few feet farther would get the oil. The second test showed considerably more gas than No. 1, which is making 3,000,000 feet daily. If no shallow oil is found in No. 2, the tests will be drilled to 2,500 feet.

The Richardson test at Freierson is down 1,400 feet in chalk, and the test of the Long-Bell Company at Nobles is 1,000 feet deep.

After three months drilling and two lost holes, the J. M. Guffey Petroleum Company, at Joaquin, Texas, near the State line, is down 280 feet, after losing two former holes before reaching this depth.

Hosston Quiet.

Developments the past week at Hosston were quiet, no wells being completed With all the wells opened, a total production of 1,000 bbls. would be had in this district but several of the wells are shut in on account of lack of treat-

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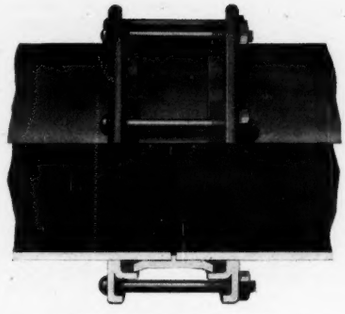

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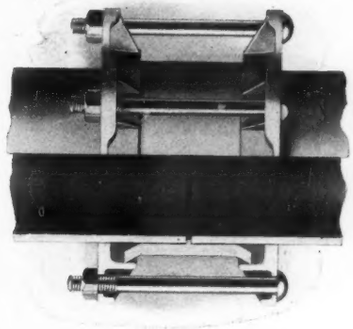

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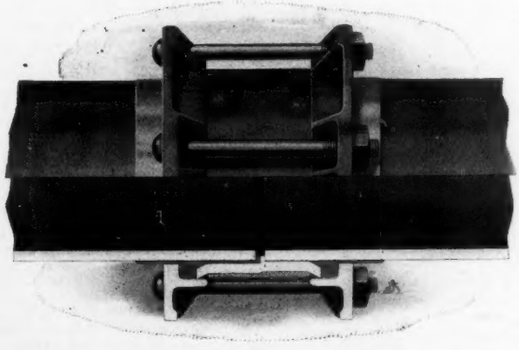

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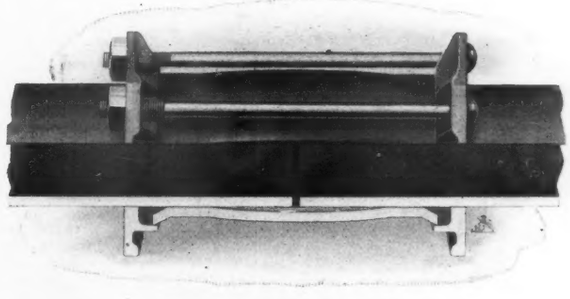

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ing facilities. Probably the largest water wells in the country are found here, some making at least 30,000 bbls. of water and several hundred barrels of oil.

The Total Production.

With the big wells of the Producers Oil Company wide open the total production of the field would run close to 50,000 bbls. As it is, probably 20,000 bbls. are being produced. The work of laying an eight-inch line from Vivian to Ardis by The Louisiana Company is more than half completed, 16½ miles being laid to date. When completed, it will be used for heavy oil.

GULF COAST REGION

FIELD SEVERLY QUIET.

One Completion at Vinton and Few of Interest at Other Points.

BEAUMONT, Tex., June 19.—(Special)—Completions in the Vinton field have been few and far between, only one well being completed during the week, the Gulf Refining Company abandoning its first test west of the lake, known as Sutton-Gray No. 1. The hole was drilled to 2,500 feet and bailed, showing salt water. Four other tests are drilling west of the lake and if all of these fail to get the oil the "west of the lake" theory will have blown up. Of the four the Hap Avery Oil Company is about 1,700 feet, G. C. Wood is down 1,500 feet, the Hillside Oil Company has a fishing job at 900 feet, and the Producers Oil Company No. 1 McNamara is 450 feet deep, so it will be some little time before these tests are completed. In the oil portion of the field, the Newman Trustee well was drilled a few feet deeper and is pumping 12 bbls. The well formerly produced from a sand at 1,150 feet. The Producers Oil Company is sidetracking in Gray No. 2 and is drilling in No. 4 on the same lease. No. 1 Bettis is 900 feet, and No. 1 Abercrombie is rigging up. The Ninety-Nine Pumping Company lost its liner in its second test and is sidetracking. The Vinton Petroleum Company is drilling No. 11 Gray in, and No. 15 on the same lease, is down 1,000 feet. The Stewart Oil Company is 700 feet deep in its first test on the Gray lease. The Crowley Oil and Mineral Company has changed to cable tools and is 675 feet deep. The Gray Oil Company has a bad fishing job in its second test and the hole may be lost, and the Newman Syndicate test and the Crater Oil Company tests in the lake bed are a little below 900 feet deep. The Gulf Refining Company is drilling Wilson No. 1, McCoy No. 1 and Gardiner-Noble-Gray No. 16. The Lake Arthur Oil Company No. 1 Toller and the Guidrey Oil Company No. 1 are about 1,200 feet deep and the McShayne Lumber Company's test on the Perry land, is down 3,000 feet.

Notwithstanding the fact that no wells have been completed recently, the production of the field hangs around the 10,000-bbl. mark. There are eight producing companies in the field.

Jennings.

No new work is being done in the Evangeline field, but the Calcasieu Oil and Mineral Company is rigging up on a location one-half mile southeast of the town of Jennings.

Edgerly.

The Twenty-One Oil Company abandoned its test at 2,540 feet; the Edgerly Oil Syndicate is preparing to make another test at 1,500 feet; the Lake Charles Oil Company is stuck at 1,250 feet and the Smith-Lucas Oil Company, a Lake Charles concern, is rigging up.

The Texas Fields.

A blowout on the Rowe lease at Spindletop, in a well being drilled by S. F. Stollenwerck, occasioned considerable excitement in Beaumont as the sand and water being blown out of the hole were plainly visible from the tops of the Beaumont buildings. The blowout occurred at 9:30 in the morning and continued until 3 o'clock in the afternoon. Very little oil appeared, and the well will be deepened. McReynolds & O'Gorman completed their first test on the Cissell lease, the well making 175 bbls. and the Unity Oil Company brought in No. 1 Trembly, a 30-bbl. producer. Eight tests are drilling, four are rigging up and two are shut down. The Stello Oil Company has abandoned its No. 17, Hogg-Swayne, and the Unity Oil Company abandoned No. 137 Gladys, a well taken over from the Guffey company.

Markham.

The Clem Oil Company drilled in No. 5 Myers, the well showing only fair and will have to be pumped. A test on the Rasmussen land to the north of production, formerly known as McCloud and associates but now called the Poor Boy Oil Company was drilled into water and abandoned. The Hardy Oil Company is drilling Nos. 33 and 34 Smith, the Prairie Oil Company is drilling No. 2, the Pay Streak Oil Company is drilling No. 7 Hudson and the Producers Oil Company is about ready to set screen in No. 6 Smith.

Goose Creek.

The report that a well had been brought in last week at this place, making 500 bbls., proved erroneous. A trip elicited the information that an old well, Gilliard N. 4, known as the discovery

OKLAHOMA SHALLOW WELL.
Ona Oil Company's No. 8, Dora Elliott, in Lenapah field.

well, had flowed two days at the rate of 100 bbls. of oil and 600 bbls. of water, when the old strainer was pulled by S. J. Hindman and R. T. Barlow, who took a lease on the land when it was abandoned by the Producers Oil Company. Efforts to set a new strainer will be made and if successful, a new hole will be drilled.

In 1907 Goose Creek appeared on the oil map with a 500-bbl. producer, drilled by the Goose Creek Oil Company, the fourth test made by the company. It was immediately sold to the Producers Oil Company, together with the lease, and after flowing about 20,000 bbls. the well went dead. The Producers drilled over 15 holes, but none showed enough oil for any commercial value and in the spring of the year, the company abandoned the field. On March 28, 1910, Patillo Higgins completed a 100-bbl well on the Wright land, the well flowing 40 bbls. on this date. Higgins' second test on the same lease is 1,775 feet deep, three hundred feet below the pay found in the first test. The past few days has seen considerable activity in land leasing and some tests will probably be started in the near future.

Sour Lake.

Two shallow wells drilled by the Texas Company, makinig 75 bbls., and an old well put to pumping by the Crosbie Oil Company, making 100 bbls., were the only completions for the week. The Texas Company's wells Nos. 180 and 181 feet, were drilled a little below 500 feet, the former making 25 bbls. and the latter 50 bbls.. The well of the Crosbie Oil Company, No. 1 Campbell, had been drilled some time but was never pumped.

Batson.

The Christian Oil Company completed No. 29 Milhome, good for 50 bbls. The Paraffine Oil Company No. 32 fee and W. C. Turnbow No. 5 Paraffine are drilling.

Saratoga.

The Rio Bravo Oil Company brought in No. 312 fee, making 30 bbls., the only completion for the week. The same company's No. 295 fee, and McBee, Gordon and Hooks No. 1 S. C. S. are drilling. The Cotton Oil Company abandoned No. 2. Petty and the Minta Oil Company abandoned No. 1 Kirby.

Wildcat Notes.

No wells were completed during the week but three deep tests are due in at any time. The Producers & Higgins Companies test is below 2,600 feet, the Sun Company's second test is below 2,550 feet and the test of the Producers on the Carroll is about the same depth as the Sun Company's test. This work is to the north and east of production, the Producers having a good well on the Carroll, and the Sun Company has a good well on the River lease, these companies' tests being close to their producers, while the Producers-Higgins test is between these wells.

The test being drilled by C. F. Miles and associates at Longview, Texas, is down 2,400 feet.

The Wheeless test at Eagle Pass, Texas, is drilling at 400 feet and the Producers Oil Company's test at the same place is down 300 feet.

The Millville Oil Company at Henderson, Texas, is shut down at 2,080 feet waiting on pipe.

The Guffey's company's test at Barbers Hill, Texas, is down 1,200 feet.

A. V. B.

PRODUCER NEAR PONCA CITY.

PONCA CITY, Okla., June 22.—(Special)—A rush of oil men to Ponca City today is occasioned by the show of oil in the 101 Ranch Oil Company's No. 12 on the big lease. The company has secured some gas but this is the first well to make any showing as an oil producer. It has already made two flows and will be drilled deeper today, when something more definite will be known.

The 101 Ranch Company has 150,000 acres under lease in this vicinity and a small producer will undoubtedly start considerable work.

Ponca City is almost due west of Pawhuska, on the Oklahoma main line of the Santa Fe.

SHOW OF OIL NEAR ST. LOUIS.

The Glendale Oil and Gas Company, of St. Louis, drilling on the Benstein farm, St. Louis county, has a slight showing of oil at 1,850 feet. The well has been drilling for more than a year but was delayed by the burning of the derrick and hard drilling.

Eight-inch casing was set at 1,400 feet and the hole has been full of water. Drilling for nearly 500 feet has all been in lime and it is impossible to say just what formation the oil is found in. Thursday morning oil appeared on top of the water, which stands 1,700 feet deep in the hole, but the quantity was small.

The operations are suspended temporarily while the company officials are debating whether to put in 6-inch or ream down the 8-inch hole.

The officers of the Gelendale Company are all residents of St. Louis and St. Louis county. They are: A. C. Taggart, president; J. W. Benstein, vice-president; Thomas Hollingshead, secretary; W. H. Jeffrey, treasurer. Directors, in addition, are: George L. Middleton, Henry W. Freudenstein, R. H. Dunaway, Gustaf Petzold, A. G. Wellmeyer and H. W. Fay.

LOOKS LIKE A DEAL.

Prominent Pipe Line Men Are Looking Over the Pearson's Properties.

TAMPICO, Mex., June 14.—(Special)—The fact that there are negotiations in progress for transfer of the Pearson's properties to Americans is evidently borne out by the presence here this week of J. C. McCue, Sam Bates, J. R. Sharp and J. E. Dowling of the Texas Company. They have taken over the properties of T. J. Reider, who came here in his private car to meet them. A number of Gulf Pipe Line people are also in Tampico, including J. F. Fisher, general superintendent; A. B. Heineman, E. T. Gatrell and J. H. Tucker.

Whether these people are here for the purpose of effecting a transfer of the Pearson's properties or simply to make arrangements for handling their product is unknown. Reports from Mexico City state that there is considerable agitation there over the Pearson's concessions and it is quite likely that any proposed deal would meet with considerable opposition. A movement is now on foot looking to a complete investigation of the grants made under the Diaz regime, and the revolutionists may endeavor to cancel most of the concessions.

The "North Town" tank steamer of the Texas Company has left New York for Tampico with a cargo of Pennsylvania oil for the Waters Pierce Oil Company and will return with Mexican crude.

The Electro Oil Company is building tanks and pipe lines and preparing to handle a heavy production before finishing its well.

Personals.

"Ot" Holleran, a Texas pipe line man, returned to the States after a short visit in Tampico.

John Stack, Richard Waltingly and J. W. McCleary, rotary drillers from Corsicana, came to Tampico yesterday.

W. E. Palmer and wife returned from California. Mr. Palmer states that the California producers all have the Mexican fever and before fall they will all be coming down to have a look.

FOREIGN PETROLEUM INDUSTRY.

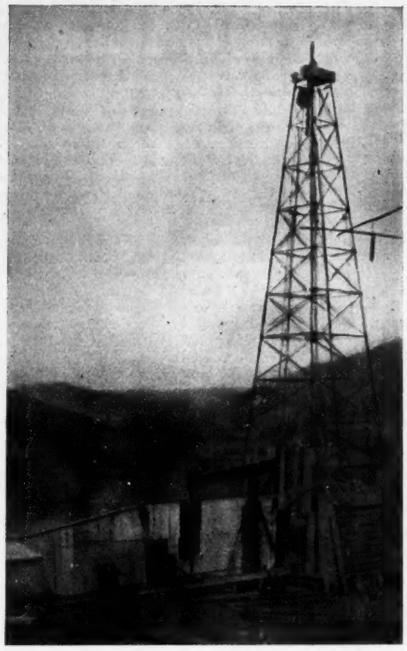
As Reviewed in Daily Trade and Consular Reports. General Notes.

A business report on the petroleum trade in Austria-Hungary regards the situation as unsettled and complicated. This condition is attributed to the fact that the numerous companies engaged in the production of petroleum are openly competing against each other and to an extent conducting their business at a loss.

It is said that several of the large refineries have been quietly purchased by foreign capital. English companies are alleged to have bought at high prices large tracts of oil territory and a number of pipe lines. Among these wells is a very productive one which was once sold at $12,180, and at this last sale is said to have brought $548,000. This well has a daily production of 50 to 75 carloads of crude petroleum. It is said that the English companies are making purchases with a view to supplying the British Navy with oil, as some of the new war vessels are being equipped with oil burners. It is rumored that the new Austrian Dreadnoughts will also be designed to burn oil. There has been a recent advance in the price of crude petroleum from 25½ to 31 cents per 100 pounds, and it will probably advance still further unless the new wells being drilled prove to be gushers.

Petroleum Exports.

The exports of petroleum from Austria-Hungary in 1910, according to published information, experienced a decline as compared with the preceding year, the diminuation being attributed chiefly to the extremely low level of prices for mineral-oil products. The total exports amounted to 494,034 tons of illuminating oil, benzine, mineral oil, paraffin, and crude oil, as against 543,905 tons in 1909. The greater portion of the exports of illuminating oil, which comprised 266,739 tons in 1910, as against 290,915 tons in the previous year, was forwarded to Germany, while France ranked as the second best customer and Switzerland occupied third place. On the other hand, the imports of petroleum in 1910 reached 37,262 tons, as compared with 21,892 tons in



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1909. The imports were mainly lubricating oil and crude petroleum from Roumania for the refineries in Transylvania.

Far East.

A campaign of considerable financial and commercial importance, that began during 1910 and is continuing into the present year, is being carried on by American petroleum interests in the Far East, to retain possession of and to extend their foreign business in the face of keen competition.

The chief elements in this contest for business are the Standard Oil Company, of New York; the Royal Dutch Petroleum Company, and the Shell Transport Company, the former a Dutch organization and the latter an English concern, working under an agreement with each other and operating through a selling company known as the Asiatic Petroleum Company, and handling oil from Sumatra and Borneo; a concern popularly known as the Dragon Oil Company, organized in Shanghai and dealing in Sumatra oil, but which has now been absorbed by the Asiatic Petroleum Company, and allied interests; and Japanese, Burmese, and Russian oil firms operating upon a smaller scale and dealing in oil from their respective countries.

Effect of Price Reduction.

In September, 1910, the announcement was made from New York that the agreement under which the American oil interests in the Far East had been working with the Asiatic Petroleum Company had been abrogated. Prices were thereupon reduced, and the consumption of oil has immensely increased, though with varying results in the several countries and districts affected. The general situation appears from the following table of the imports of kerosene during 1909 and 1910, the quantities being in gallons:

	1909	
Countries.	American.	Other.
China	121,742,688	64,342,262
Indo-China	6,680,000	4,666,000
Philippines	7,710,000	2,100,000
Japan	33,941,605	23,485,311
Siam	2,010,000	4,940,000
Total	172,084,293	99,533,573

	1910	
Countries.	American.	Other.
China	*149,743,506	*74,637,624
Indo-China	6,372,000	6,260,000
Philippines	8,950,000	2,190,000
Japan	47,141,356	21,826,775
Siam	1,950,000	5,510,000
Total	214,156,862	110,423,799

*Partly estimated.

These figures, allowing for a margin of inaccuracy in the total for all China, indicate that during 1910 the imports of kerosene into countries east of the Straits Settlements, but including Siam, increased over 50,000,000 gallons as compared with the receipts of the previous year, a gain of about 19 per cent. Imports of American oil were 42,072,569 gallons, or nearly one-fourth larger than in 1909, while imports of oil from other countries, chiefly from the East Indies, were 10,890,226 gallons, or about 11 per cent more than in the preceding twelvemonth. The immense force of price reduction in this campaign appears in the fact that in most of this field the increase in imports in the first half of the year was small, if it existed at all.

Outlook For Year.

In general the lowering of the price of oil in the East has eliminated the smaller concerns and competition at the present time is narrowing down to the American interests and the Asiatic Petroleum Company.

The price of American oil in this portion of the Far East during 1910 averaged about the equivalent of $1.10 gold per case of 10 gallons. For the first eight months of the year the price ranged somewhat higher. After August the price was lowered as much as 42 cents gold in the course of a short time. East Indian oils sold at varying preferentials below the American product in keeping with recognized differences in the respective qualities and grades.

There is practically no limit to the possible increase of business in American oil in the Far East if present favorable price conditions can be maintained. It is evident that American producers will have to take less for their oil per gallon than formerly, but by so doing they will be able to dispose of their vastly increased output not only at present but indefinitely in the future, and the business will be placed more and more upon a permanent and satisfactory basis. The prospects for the coming year are that low prices will prevail, for a time, at least, and probably until consumption is more in proportion to production. American sales are likely to continue their increase, but it is doubtful if the market will go much, if any, lower than it has been ranging. It is probable that in the ordinary course of things consumption will steadily grow.

Japan.

In 1900 a stir was caused in Japanese oil circles by the comencement of operations in the south of the Province of Echigo by the Standard Oil Company of New York, through the medium of the Pacific Oil Company, incorporated in accordance with Japanese law, with a capital of 100,000 yen (about $50,000), ostensibly as a joint American and Japanese concern. In the following year the International Oil Company, a similar undertaking, was launched by the Standard Oil interests, with a capital ture, sold out to the Nippon Company which doubled its capital to effect the purchase, and thereby acquired, in 1907, large and valuable holdings, pipe lines, tank cars, and other accessories, as well as the best-equipped and most modern refinery in the country, with a staff of American-trained Japanese employees.

Field Notes.

From that time the Hoden and Nippon companies have been the chief and only really important concerns in the industry. The former, created in 1893 from the small companies operating in Higashiyama, with a capital of only of 10,000,000 yen ($5,000,000).

Japanese apprehensions proved to be groundless, as the Standard Oil Company, not making a sucess of the ven-15,000 yen ($7,500), has, by repeated amalgamations (to the number of 127 at least) and various expansions of business, made itself the largest company of its kind in Japan, with a capital of 11,650,000 yen ($5,825,000). Including its fields in the Hokkaido and Formosa, with a few other small centers, the company has over 1,300 wells, producing more than 4,000 koku (1 koku=47.653 American gallons) per day. Like the Nippon Company, at Kashiwazaki, the Hoden Company has, at its chief refineries, factories for the production of tin and wooden cases, and regularly turns out more than 300,000 tin cases per month for its own use. The Hoden and Nippon companies between them produce about 86 per cent of the total oil output of Echigo.

The oil industry of Japan is domestic; that is to say, all the oil produced in the country is consumed in the home markets. There is, it is true, a certain amount sent to Fusan and Ginsen, in Korea, but this may be regarded as for home consumption. The amount produced, however, does not by any means suffice for the needs, and to make supply meet demand a large amount has to be imported.

The production of oil in Japan grew in 20 years from 45,006 barrels in 1888 to 1,727,298 barrels in 1907. The production from Echigo being reckoned at 99 per cent of the total, these figures may be taken as indicative of the very great development of the oil industry in this Province. There are many separate oil fields in Echigo, bearing different names, but they are generally grouped around one of the four principal centers of the industry, and are thus best treated as component parts of entire districts. These districts are called respectively Niitsu, Nishiyama, Higashiyama, and Kubiki, and their relative importance may be taken as in the order given. Two smaller unattached fields are those of Ojiya and Gochi.

It should be noted here that, according to statements made by the leading engineers of the district, the oil-bearing strata of Echigo differ greatly in formation from those of American and Russian fields. In the latter places the strata are extensive in area and for practical purpose inexhaustible, while in Echigo they are split into numerous very small areas, or "pockets." The average life of a well in this Province, according to Japanese engineers, is from five to seven years, and after this period, of production the well usually has to be abandoned, as experiments have shown that wells once drained down to the lowest horizon do not yield again. The system of deep boring, now being more generally employed, should appreciably lengthen the productive existence of wells. In some fields natural gas is produced, and, where found, is used as fuel for the engines of the boring apparatus. The gas obtained from the Nishiyama field allows this fuel to be used almost generally in that district.

In actual figures the total production of oil for the Province of Echigo shows an increase, but, well for well, the output is said by the experts of the various companies to show a marked tendency to diminish. The total production for the first half of the year 1909 was 856,298 koku (40,805,169 gallons) and for the second half 884,400 koku (42,144,313 gallons). Japan, with a population of 49,319,166 (in 1908), consumes oil at the rate of 0.397 koku (18.918 gallons) per head per annum.

Mining Rights.

A landowner in Japan owns the surface and products of the surface of the land only; all minerals under the surface appertain not to him but to the Japanese Government. Moreover, should the Government or its nominee wish to extract the minerals lying under a landowner's property, the latter, though he would of course receive compensation for loss, can not object on legal grounds to the development of those minerals.

The sulphuric acid used in the refineries is mostly supplied by two Japanese companies, but the Nippon Company has its own acid and soda works and can supply its own needs. The caustic soda used is mostly imported from England. The engines (steam and oil), pumps, and drills are nearly all Japanese makes, but some special pumps are obtained from America, whence are imported also the tin-can plant and bore pipes. The other pipes, as a rule, come from Scotland and America.

The rupture between the two foreign oil companies doing extensive business in Japan, (the Standard Oil Company, of New York, and the "Rising Sun Oil Company," as the Asiatic Petroleum Company, is designated in this country) has now somewhat healed. While it lasted the Japanese companies were hard pressed, and were forced to lower their prices to meet competition. At the beginning of November, 1910, oil was selling at only 2 yen (about $1) per case, an absolutely ruinous price for the seller, and one company alone is said to have lost over 130,000 yen ($65,000) in four months, a large sum for a Japanese concern.

Borneo.

The reports of the British Borneo and Burma Petroleum Syndicate (Ltd.) on oil in Borneo are very favorable. One deep and two prospecting drilling plants have been sent to the fields in North Borneo, and the operators report a fine quality of oil found at the depth of 1,110 feet. Deposits have also been recently found in Sarawak, on the west coast of Borneo, oil "pays" being encountered at 450,640, and 725 feet. The Shell Transport and Trading Company has issued new stock to the amount of $2,500,000 for the development of this land.

The syndicate has leased the oil land for 999 years from the British North Borneo Government at 24 cents (per acre?) per annum, and their products are exempt from royalty and export duty. The leasehold property consists of 440 square miles, with exceptional facilities for marketing the products. In addition to the above, they held the sole concession for the development, on the same favorable terms, of petroleum in the whole of British Borneo, an area of over 30,000 square miles.

The important shipping port of Labuan, in British North Borneo, is a naval coaling station and was selected by the British navy on account of its strategical position and the presence of coal mines there. Within the last few months, however, these coal mines have been closed and all the machinery has been removed, as the mines had become unprofitable, and, in view of the probable adoption to a large extent of oil as fuel, these fields are regarded as compensating, in a measure, for the loss sustained by the closing of the mines.

The development of this territory should create a market for well-drilling machinery, etc., on a large scale. Up to date, however, the project is only in the experimental stage, and it will probably be some months before extensive operations will be decided on.

CHINESE USE OIL STOVES.

The climate of Canton is semitropical and the Chinese seldom or never heat their houses. If they did so they would more than likely use the simple native charcoal brazier or the more convenient oil stove. There is no demand among them for steam or hot-water radiators. The foreign dwellings and offices on the Shameen and in the district generally are usually built with open grates, which is all that is required to secure comfort in normal seasons. During extremely cold spells the grates are sometimes helped out by coal stoves put up temporarily or by oil stoves, of which an excellent and convenient model is now sold on this market by an American firm. The value of stoves and grates imported at Canton in 1909 was $2,300.

The Chinese do their cooking entirely on Chinese stoves, which are structures of brick and mortar not unlike a blacksmith's forge, and many of the native cooks employed in foreign families prefer this stove to the modern range. The demand for foreign cooking stoves or ranges is confined to a fraction of the foreign population of the district, say, 500. Foreigners away from Canton itself generally allow their cooks to use Chinese stoves. Oil stoves for cooking purposes, of various sizes and shapes, find a small sale in Canton, as do also spirit lamps, for minor cooking and water heating.

OIL BURNING ENGINES IN GERMANY

Consul Robert P. Skinner, of Hamburg, Germany, writing in the Daily Consular and Trade Reports, says that the great demand for small explosive engines consuming gasoline, which has been especially noteworthy during the last few years, naturally has directed the minds of nearly all enterprising builders to the possibility of producing a somewhat similar engine which would operate successfully with cheap crude oil as a combustible.

As is well known in engineering circles, successful motors of large dimensions burning crude oil as fuel and constructed according to the Diesel principle have been upon the market for some years, and in fact the patents upon motors of the larger size have already expired. In these motors the carburetor necessary in gasoline motors is eliminated altogether. Engines of this type will be installed in the large 8,000-ton experimental ship now being built for the Hamburg-American Line.

Fuel Economy and Simplicity.

It is now understood that motors of this kind of from 5 to 30 horsepower have been perfected and are likely to be introduced commercially within the next few months, having already been exhibited at the Brussels exposition by Diesel & Co., who, as may be inferred, brought out the original motor of this type. If they accomplish all that is claimed for them their success scarcely can be doubted, although their cost will be considerably in excess of the cheap low-powered motors burning gasoline, of which many makes are available. The average cost of operating a 10-horsepower motor 10 hours with crude oil in Germany is 30 to 50 cents, theoretically, whereas the same power with gasoline would cost from $1.50 to $2.50. However, fuel economy is not the only advantage claimed for the new engine. The danger of handling crude oil is very much less than that involved in handling gasoline and the storage of the fuel is much simpler.

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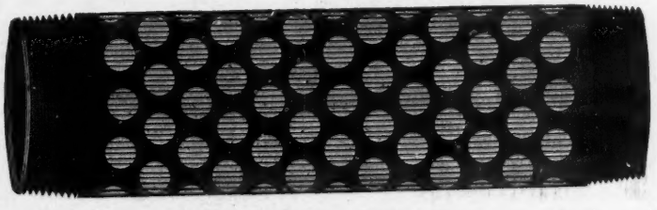

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These small motors will have neither carburetors nor lighters nor magnetos. The liquid fuel is exploded in the cylinder by the introduction of a jet of compressed air of a certain temperature. It is claimed that the consumption is perfect, that the starting is automatic, and that there are no brusque variations of pressure while the engine is in operation.

It is to be hoped that American manufacturers who are experimenting along these lines will be ready soon to propose an engine of the class described, for which there is a popular demand not only in Germany but particularly in Russia, where crude oil is being utilized at the present time much more generally for motive power than it is in the United States. A number of engines consuming crude oil are being sold in Russia, and although none is entirely satisfactory, the economy of operation overcomes the various inconveniences which they present. One of my informants who is familiar with a 14-horsepower engine of this type in daily operation in Siberia states that it develops only 9 horsepower, although more could be obtained if necessary, and in so doing consumes three-fourths of a pound of fuel per horsepower hour. The usual rate of consumption under less expert management is 1 pound of fuel per horsepower hour.

It is likely that the last word in the construction of low-power petroleum-burning motors will not be said in a good many years. Efforts to utilize petroleum with a carburetor and ignition apparatus have yielded indifferent results, and, for a time, the consumption of petroleum in this manner seemed to increase. Nevertheless, the obvious advantages of a fuel so plentiful and cheap as crude oil have kept many engineers at work upon the problem, and it now seems probable that a noteworthy advance has been made and one susceptible of many applications in the small engine to which reference has been made here.

Oil Pumps and Tanks.

Catalogues descriptive of American oil pumps and tanks shown to various Hamburg firms have elicited considerable interest. There is undoubtedly a steady demand for these devices and one likely to increase with the more general use of oil-burning engines. It has been suggested that American manufacturers should see to it that where gauges are attached to tanks they should be graduated in meters, and that the threads on piping for the attachment of hose should be according to the English standard.

EASTERN FIELDS

ILLINOIS, PENNSYLVANIA, WEST VIRGINIA, OHIO, INDIANA, KENTUCKY

QUIET AT CARLYLE.

Few Wells Drilling In. Some Good Producers. Field Notes.

CARLYLE, Ill., June 21.—(Special.)—Little has developed in the Carlyle field the past week which would materially effect the situation, although it is generally regarded as a losing proposition for those on the outside. The efforts to extend the pool any distance have not proved availing, and it now looks as though it would resolve itself into a proposition on the plan of the Sandoval field. Good wells are being obtained within the defined limits, F. B. Ranger getting a nice producer in his No. 4 on the Maria Smith farm, section 10, Wade township, while his No. 5 is also showing up for a fair producer. No. 4 was shot today and will probably make 200 bbls. No. 5 encountered a sand at 902 feet, much higher than the pay in that country, and at 12 feet in looks good for 75 bbls. While the Ranger wells are located within the defined limits, the production is sufficient to encourage any operator to take a chance on that kind of property. The Ohio Oil Company has a good producer in its well on the Henry Wilkins farm. It was shot last night and the casing put back in. On the Dumsdorff farm, about four miles northwest of the producers Shafer & Smathers got a duster in their test. Selby, Cisler & Skelly are fishing on the Peet farm, seven miles northwest of the production and will finish up in a day or two. An important test in the Sandoval pool is the well on the Carmichael farm, south and west of production.

In Lawrence County.

The best of the late finds in the Petty township field, of Lawrence county, is the Ohio Oil Company, and associates No. 28 on the southwest corner of the W. R. Crackle farm, section 29, which produced 200 bbls. from the Kirkwood sand. The Bridgeport Oil Company's No. 11 A. Baltzell farm, section 30, produced 150 bbls. from the Bridgeport or shallow sand. In Lawrence township, same county, the Ohio Oil Company's No. 6 J. A. Seed farm, section 10, produced 170 bbls. from a depth of 1,588 feet.

The best of late wells in the Crawford county field was Frank L. Huntoon and associates test on the southeast corner of the P. E. Hauts farm, in the northwest quarter of section 20, Montgomery township. This test produced 210 bbls. and adds additional territory to the field. Leasers have been active around the new well since its completion and the usual heavy bonus prices for territory has prevailed.

In the Bellair pool, in Licking township, Crawford county, J. W. Salley and associates drilled a 150-bbl. natural producer in No. 9, Susannah Smith farm, section 11. In the Oblong township field, the Kewanee Oil and Gas Company's No. 9 on the Matthew Shiltz farm, section 8, is credited with a production of 317 bbls.

James Lynch has secured an oil and gas lease on the Crawford county poor farm on a rental basis of $1 per day after sixty days if a well is not completed in that time The farm is located northwest of Trimble and the fact that operators want leases in that vicinity shows that they still have faith in Crawford county territory.

Central Ohio Results.

The center of attraction in the central Ohio field, especially in an oil way is around New Straitsville in the southeastern part of Perry county and Gore and Oreville, in the northeastern section of Hocking county. Some test work is being planned for the vicinity of Webb Summitt, in Falls Gore township, and west of the Gore field, and should oil be found in paying quantities it will add a number of miles of undeveloped territory to the field which is rapidly growing into prominence. Operations from the oil producing field is gradually nearing Logan and if reports can be relied upon there will be test wells drilled soon within sight of the capital of Hocking county. All the land for miles around is leased up and leasers are still working in an effort to secure property.

The Browne-Moore Oil Company turned a deal a few days ago which gives that company some of the most valuable looking leases in the field, besides a well already completed that is reported good for close to 65 bbls. a day. The holding of the Carmi Oil Company, of which J. J. Klise is the operating manager were purchased by the Bowen company. This deal includes the R. B. Tucker lease with a completed well, and the second well now drilling; the Linton heirs lease in Green township, Hocking county, containing 176 acres with a test now drilling. This last location is 1,800 feet due north of the Griffin Drilling Company's big well on the Williams farm. This also includes two locations in New Straitsville and two in Oreville. It is the largest transaction yet pulled off in the New Straitsville field. The acreage is all within defined limits, wells being close to the leases. The consideration is not known nor will the buyers or sellers announce the price, although it is hinted that close to $50,000 changed hands on the deal. This company's well on the Gardner property, drilled in a few days ago and thought to be dry, has been given a shot and will make a light producer. The owners are so well pleased that they have made a location for No. 2 on the northeast corner of the same lease. The well will be started as soon as the contractors complete No. 2 on the Tucker lease, as the same tools will be used in No. 2 Gardner farm.

Pittsburg parties will make a test of some territory near Oldtown, on the Peter Berry farm. The concern owning the lease has started work. The location is in close proximity to the Bending joint well which was drilled by the Acres, Crockett Run and Hocking companies. Much trouble was experienced in this hole. The well made a showing, but was spoiled.

The Kumfort Oil and Gas Company expects to start its test well on the Adcock lease, known as the Ham Lemon property near Webb Summitt, in the western part of Fails Gore township, Hocking county, within a few days. This rig was put up last fall and a boiler placed upon the ground, but the leases at New Straitsville looked better and the Lemon well has been delayed on that account.

Considerable Leasing.

The Central Contract and Finance Company has done considerable lease work in Hocking county of late. It has secured the Minnie Allen 156 acres, Benton township; William Armstrong 104 acres, Salt Creek township; George Anderson 168 acres, Perry township; Jacob Bowers 84 acres, Washington township; Clara E. Brashares 84 acres, Salt Creek township; Hannah L. Bixter, 41 acres, same township; Samuel Blum 72 acres, Falls township; George F. Blum 128 acres, same township; George Blum 72 acres, same township; John H. Blum 125 acres, same township; Henry Brown, 222 acres, Marion township; Simon Beougher 45 acres, Perry township; John C. Butler 246 acres, Salt Creek township; James Collison, 96 acres, Washington township; Dorathy A. Collison, 45 acres, same township; George B. Culp 71 acres, Benton township, and Daniel Carpenter, 78 acres, Falls township.

John J. Nash secured leases on the Hite farms, containing 66 acres in Fallas and Green townships, Hocking county.

S. W. Rigby leased the one-half acre tract of Jacob Denny, in Falls Gore township, and will drill a test. The Chartiers Oil Co., leased the A. M. Sweasey 54 acres, in Green township.

Clark & Mayer are drilling a test well on the H. Noland farm, in Pike township, Coshocton county. The Ohio-Rochester Oil and Gas Company, which controls a large acreage in this field, contemplate starting development work soon.

Drilled Deeper.

In Marion township, Perry county, in the Crooksville field, the Crooksville Oil and Gas Company has drilled deeper its old gas well on the J. Brannan farm, and it shows for a 10-bbl. producer in the Clinton sand.

In the Bremen field, in Rush Creek township, Fairfield county, the Carter Oil Company's test on the Noah Berry farm, shows for a 10 or 15 bbl. pumper, while No. 4 S. A. Black farm, owned by the same company, shows equally as good. Same company's test on the B. F. Neely farm, is showing for a duster. Just south of Bremen, the test drilled by J. E. Purvis on the Fred Mericle farm, shows for about 500,000 feet of gas, but the owner will in all probability abandon the well, as there was no showing of oil.

In Jackson township, Perry county, in the Junction City end of the field, the Goebel Oil and Gas Company's test on the S. C. Elder farm, is showing for 25 bbls., while the Carter Oil Company's test on the Mary R. Henry farm, shows for 15 bbls. Same company's No. 5 H. T. Purvis farm, shows for 20 bbls., and the Ohio Central Oil Company's No. 1 Hattie Love farm, shows for 25 bbls.

In Coal township, Perry county, in the New Straitsville end of the field, the Kumfort Oil and Gas Company's test on the Noble property, shows for a 100-bbl. producer.

At Oreville and Gore, in Falls Gore township, Hocking county, C. N. Bowen & Company's test on the Bolton Gardner property, is through the Clinton sand and a duster. The hocking company's well on the Joseph Stevenson lot, shows for 40 bbls., while the Wisher Oil and Gas Company's No. 2 T. S. Wright lot, is showing light.

PITTSBURGERS LOST HEAVILY.

Fall of Carlyle Hit Some of the Old-Timers in the East.

PITTSBURG, Pa., June 21.—(Special)—The flunk of the Carlye pool, in Clinton county, Ill., and the developments in the local pool, near Perrysville, Allegheny county, were the topics most discussed by eastern oil men during the past week. In the first-named development there was probably more capital invested by Pittsburg operators than from all other sources combined. It is now the consensus of opinion that the Carlyle discovery is nothing more than a congested pool and its producing limits not likely to be extended much if any beyond the present defined area.

It is admitted that the bonus money paid for leases in the field runs well into six figures, and unless the unexpected happens the greater part of it is hopelessly lost. There has been a good deal of adverse criticism on the part of some who failed to secure holdings, as to the reckless way bonus money was expended in Carlyle territory. The payment of $100 or more, as in a few cases, an acre is conceded to be a pretty stiff price. These high prices prevailed at a time when the outlook for a field was most promising. The Smith and Murphy farm wells are located a half mile apart and both good producers, despite the fact that both had been poorly handled when drilled in the sand, and would have made a better showing at the start had they been properly managed. As to this phase of the situation, there was no secret. Neither well had been put in proper shape till several weeks after completion, and in the meantime the demand for leases became very great and the landowners took advantage of the opportunity to exact higher prices than was warranted by later developments. Those who are inclined to decry the judgment shown by operators in the prices paid for leases do not recall that the Carlyle discovery was made at a time when operators in all parts of the East were anxiously awaiting the discovery of new producing territory or would be forced to remain idle during the early part of the year and possibly to its close. The desire to get busy was an incentive to pay larger bonus than was the rule for conservative and experienced operators. The fortunes made in the Robinson field was still fresh in the minds of many who invested in the Carlyle territory, and those who played it for a winner took a gambler's chance and put in some of their previous winnings.

Experienced Operators Invested.

The greater part of the money invested in Carlyle territory was by operators who had grown old in the industry, and in no way could be charged to inexperience. At the time when the excitement was at its zenith the investments seemed to be justified. Had the field, as was expected, proved another of the size and productiveness of the Robinson field, the prices paid would not have been exorbitant. There were leases in the Robinson field that would have been a bargain at $500 an acre. It is much easier to look backward and point out mistakes than to

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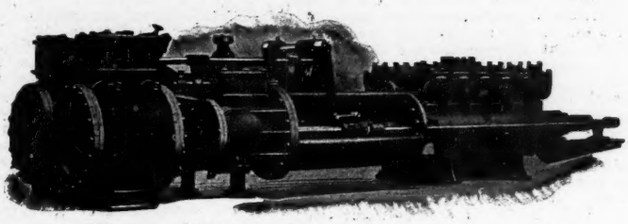

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anticipate them from an uncertain viewpoint. In the majority of cases those who played to win and lost can afford it, and from the fact that prices were boosted kept many small operators out and they cannot boast, now that the field is a failure, to have had better judgment and exercised it by withholding their money.

With the passing of Carlyle, the eastern fields are left without a prospective pool. However, the state of Illinois has not been so fully tested as to preclude the possibility of discovering a new field. Every oil-producing state has had its disappointments, and the Carlyle failure will not discourage the talent to the extent that the search will be abandoned. There is more reason for continuing explorations in Illinois than in any other eastern state where operations have been active for years.

Nothing But Ordinary Wells.

In all of the eastern divisions nothing out of the ordinary was developed during the week. The usual number of wells were completed and their average size about the same as has prevailed for so many months. In completed work Ritchie county, W. Va., leads all other districts, and Roane county was a close second. The completions in the last-named county showed a better average than during the preceding week, but there were not enough of them to give an increase in production. Ritchie county secured some fair producers, but they were outnumbered by the light wells and dry holes. This is true of every district in the eastern fields, the deep sand territory in West Virginia not excluded.

The search for new producing territory in Ritchie county has not abated and it can claim more experimental work under way and starting at this time than any other county in the state. The new work of that character is not confined to any particular locality, but is scattered very generally through Murphy and Grant districts.

On Rock Camp run and Sardis district and on Ten Mile creek, in Ten Mile district, Harrison county, there is more new work starting than at any time in the past six months. It is an erratic development and the territory developed shows some good producers, light pumpers and dusters on a small area. Of all the operations in Harrison county, three-fourths is backed by the gas companies. The same is true of Doddridge and Marion counties.

On Church run, in Church district, Wetzel county, some new work in the vicinity of the Carnegie Natural Gas Company's good producer on the Hemelrick farm is nearing the interesting point. The way the initial well has been holding up makes it look encouraging for more new production from that quarter.

Southeastern Ohio.

The deep sand territory is the only district in southeastern Ohio that calls for special mention. The south and southwest extension in Hocking and Perry counties is the section that now attracts attention. Two good producers and one very light well, located on the T. S. Wright lot in Falls Gore township, Hocking county, was the offering for the week.

The shallow sand districts are fairly active, but the results very mediocre. The few good wells are found in the Rears Run district, in Washington county. Wildcat operations have been so unsatisfactory that there is now very little work of that kind.

The Pennsylvania Fields.

The Perrysville development in Allegheny county was the most interesting local development and the discoveries most unsatisfactory. Three wells were completed. The Jones farm test, 1,100 feet south of the Schwartz producer; the Kaylor farm test, 1,100 feet to the southwest, and the Rynd farm test, 1,100 feet to the west of the same well. The first-named was completed and shot and is a light producer. The second is probably a failure and the last a light producer.

With the completion of these wells the hope for an extension in the directions named has gone glimmering. Unless better results are obtained to the north, northeast or east, the Schwartz well will have the unenviable distinction of being a freak. Soon after the well was drilled in, quite a little bunch of bonus money was paid for near-by leases.

Field Developments.

In the old Shinston district, Harrison county, W. Va., the South Penn Oil Company has drilled No. 3 on the W. L. Lowe farm through the fifty-foot sand and has a show for a very fair producer. It is estimated to be good for 80 bbls. a day. The same ompany's No. 7 on the S. L. Vincent farm is holding up at 100 bbls. a day.

In the St. Mary's district, Pleasants county, Edmonds & Company have drilled a second test on the G. K. Ruttencutter farm through the Cow Run sand and will have a 5-bbl. pumper. C. G. Westerman & Company have completed No. 12 on the A. Ruttencutter farm and have a 10-bbl. pumper in the same formation.

On Worthington Creek, Union district, Wood county, the Peterson & Sweeney Oil Company has completed No. 7 on the Ralston estate and has a duster in the Berea grit. On Gillespie run in Clay district, Albert Congdon & Company have drilled No. 4 on the Stan Musser farm through the salt sand and have a duster.

On Long run, Grant district, Ritchie county, the States Oil Company has now drilled through the Big Injun sand and have a duster. On the same stream, the Davis Oil Company has drilled a test on the Walter Hartleben farm through the salt sand and found it barren.

On Doe run, Murphy district, the Carter Oil Company has abandoned its second location on the P. M. Jones farm. On the south fork of Hughes river, the Number Two Oil Company is rigging up at a test on the Martin Deems farm. On Indian creek, the Washburn Oil Company has started to drill a second test on the E. R. Nicholsen farm. On Big Bingamon creek, Sardis district, the Hope Natural Gas Company has drilled a test on the Mary Huey farm through the fifth sand and has a fair gasser. On West Fork river, Eagle district, the same company has drilled a test on the Sarah Fortney farm through the Gordon sand.

West Virginia Gassers.

On Line run, Spencer district, Roane county, W. Va., the Ohio Fuel Company has drilled its second test on the C. P. Weaver farm through the Berea grit and has a fine gasser, with an estimated capacity of 8,000,000 cubic feet a day. On Pad Fork, Walton district, the United Fuel Gas Company has completed a second test on the Dougherty heirs' farm, and has a 30-bbl. producer in the Big Injun sand. At Shinnston, Clay district, Harrison county, the South Penn Oil Company has drilled No. 3 on the W. L. Lowe farm deeper and the hole has filled up 700 feet from the fifty-foot sand.

Gasser in Lewis County.

On Murphy creek, Court district, Lewis county, the Philadelphia Company has drilled its test on the O. R. Wheeler farm through the fifth sand and has a fair gasser in that formation. On the same stream and in the same district, the Weston Carbon Company has drilled its No. 5 on the A. S. Fisher farm through the salt sand and has a 25 or 30-bbl producer.

In the Warwood development, Richland district, Ohio county, Davis & Company have drilled their test on the Carpenter lot through the Berea grit and have a light gasser. The same parties have completed a well on the Peditt lot. Secured a small gasser. Stenger Bros. have completed their No. 7 on the same farm and had the same kind of luck as Davis & Company. The three wells are located inside of defined limits.

On Link Fork, Spencer district, Roane county, the Pocatello Oil Company has drilled a test on the Cummins farm through the salt sand and developed a light show of oil. It is now drilling to the lower sands. On the same stream, the Consolidated Oil Company is starting a test on the Elijah Carpenter farm.

The Buckeye Fields.

In the deep sand territory in Southeastern Ohio, in Rush Creek township, Fairfield county, the Carter Oil Company has completed its test on the J. W. Kegey farm and has a duster in the Clinton sand. The same company is starting No. 3 on the I. B. Brown farm.

In the vicinity of the good producers and the Stoner and Guyton farm Richie & Company have completed a test on The Guyton heirs' farm and it does not show for better than a 5 or 10-bbl pumper. This location is only 600 feet west of the Carter Oil Company's No. 1 on the L. V. Guyton farm, which is still holding up at 100 bbls. a day. The same company's No. 1 on the C. Lehrone farm is holding up at 105 bbls. a day.

In the Payne district, Liberty township, Washington county, C. E. Smith has drilled No. 6 on his own farm through the Keener sand and has a duster. In the same locality M. W. Donally has drilled a test on the Jennis Cuthbert farm through the Buels Run sand and has a very light pumper. In Lawrence township the Enocks Oil Company has drilled a second test on the Mary M. Enocks farm through the salt sand and has a 10-bbl. pumper. Near Scottown, Ludlow township, the Pure Oil Producing Company has completed No. 5 on the Charles Cawley farm and has a light pumper in the first Cow Run sand. On the river front, in Belmont county, the Carnegie Natural Gas Company has drilled its test on the Laughlin mill property through the 100-foot sand and has a duster. In the same locality the Terminal Oil and Gas Company has drilled a test on the Lake Erie Railroad right of way, thrugh the Berea grit, and has a light gasser. Davis & Schell got one of the same kind at their test on the Kehrer farm, and Tague & Company scored a duster on the John Smith farm.

New Work in Perry.

In Falls Gore township, Hocking county, the Chartiers Oil Company has started to drill a test on the George Auker farm and has the rig completed for No. 5 on the George W. Tucker farm. The Biennerhassett Oil Company has started to drill a test on the H. K. Stark farm. The Grifan Producing Company is drilling No. 3 on the Williams farm to the Berea grit for gas. John A. Beck & Company have a rig up for a test on the R. D. Litton heirs farm. One-fourth mile northeast of the production on the Williams farm, in Coal township, Perry county, the Ilone Oil and Gas Company is drilling a second test on the J. C. Wion farm, north of developments. In the southwest corner of Muskingum county Boyce Lang & Company have the rig completed for a test on the Mary J. Wolf farm, located 1,000 feet west of their No. 1 on the same farm. There is very little new work starting in Muskingum, Coshocton and Licking counties.

In the Caldwell district, Enoch township, Noble county, the Lee Oil Company has completed No. 10 on the Lee Crum farm and has a duster in the Buel Run sand. No. 11 on the same farm has been drilling through the same formation and is a very light pumper. In the same disrict the Crescent Oil and Gas Company has drilled No. 9 on the Isaac Rupel farm through Buffalo township, in the same county, the Buffalo Oil and Gas Company is drilling a second test on the Miley Bros. farm.

In the Reas Run district, Washington county, Reishman, Nickle, Gregory & Company have drilled their test on the Ridgeway Bros. farm, located in Grand View township, through the the sand and has a 5-bbl pumper. In Cow Run sand and have a duster.

Monroe County.

In the Rinards Mills district, Monroe county, the Carter Oil Company has the rig completed for a test on the R. G. Cline farm. The Pure Oil Producing Company is drilling at 600 feet at No. 6 on the G. B. McFadden farm. W. C. McBride has started to drill at No. 18 on the Fred Ullom, and Smith & Company have the rig completed for No. 3 on the D. W. Platt farm.

The indications for a pool at Greater Pittsburg's back door, and located near Perrysville, are not looking very bright. The three wells started after the Schwartz gusher was drilled in and were expected to show an extension in at least three directions are small, with possibly one of the three a total failure.

The Jones farm test, 600 feet south of the Schwartz producer, the first completed after the Schwartz well, has been put to pumping and is not good for more than 10 or 15 barrels a day. The test on the Rynd farm, located 1,100 feet west of the Schwartz producer is about the same kind of a producer. The Benedum, Trees, Parker & Donaldson test on the Mary A. Kayloe farm is 25 feet in the sand and has no show of oil or gas. As a third sand producer it is a failure and will be drilled deeper. On the presumption that a new pool had been discovered, the location on the Rynd farm was thought to be the one best bet.

On the east side of the Ingomar pool, in Allegheny county, Fowler & Co. have drilled their test on the Watenpool farm 70 feet into the 100-foot sand and have found nothing. It will be drilled to the lower sands for gas. In the same locality, the Cameron Oil Company is down 500 feet at its test on the Pfeffer farm.

Grubbs & Co.'s test on the Grubbs farm, located between the Ingomar and Lowry Run pools, which was dry in the 100-foot sand, has now been drilled to the lower sand and is a small gasser. In the same locality, Pence, Walley & Co. are deep in the 100-foot sand at their test on the C. Richey farm and have no show for a producer. Should it prove a failure in the Century sand it will be drilled down for gas. Riley & Co. are down 500 feet at their No. 3 on the Montgomery farm.

In East Finley township, Washington county, Pa., the Manufacturers Light and Heat Company has drilled its old fourth sand gasser on the Caroline Clark farm to the fifth sand and has a show for a 12 or 15-bbl. pumper.

D. S. W.

NEW INCORPORATIONS.

The Harris Oil Company, of Houston, Tex., has been incorporated for $4,000.

The Red River Oil and Gas Company, of Bowie, Tex., has been incorporated with a capital stock of $32,000.

The Nash Oil and Gas Company, of Texarkana, Tex., has been incorporated with a capital stock of $4,000.

The Brilliant Oil and Gas Company, of Steubenville, O., has increased its capital stock from $40,000 to $50,000.

The Sugar Creek Oil and Gas Company, of Mt. Vernon, O., has increased its capital stock from $25,000 to $30,000.

The Bryan Oil and Gas Company, of Bryan, Tex., has been incorporated for $20,000, by A. A. Snell, J. K. Parker, J. W. Deemus and associates.

The Derrick Oil and Gas Company, of Bridgeport, Ill., has been incorporated for $500,000, by Arthur J. Tubbs, Harold Johnson and J. J. Niltenberger.

The Verlie Oil Company, of Tulsa, Okla., has been incorporated for $10,000, by R. J. Allison, L. C. Hivick and B. L. Baldwin.

The Bell Prairie Oil and Gas Company, of Houston, Tex., has been incorporated for $20,000, by H. R. Bartlett, M. S. Ainslie and Rockwell Hoskins.

The Fort Worth Oil and Development Company, of Fort Worth, Tex., has been incorporated for $30,000, by B. F. Allen, Jr., J. B. Hagler and Clifford C. Beckham.

The Texcalutah Oil Company, of Beaumont, San Francisco and Salt Lake City, has been incorporated for $200,000, by George W. Newman, Charles D. Dickensheets and M. D. Adams.

The Ventura-Ojai Oil and Gas Company, of Los Angeles, Cal., has been incorporated for $200,000, by Alfred Solano, H. L. Hays, Harry Logan, L. B. Davidson and E. G. Woodbridge.

The Dinuble Oil Company, of Cleveland, O., has been incorporated with a capital stock of $5,000, by E. H. Shannon, F. N. Casti, M. M. Moore, F. H. Saxton and P. W. Payne.

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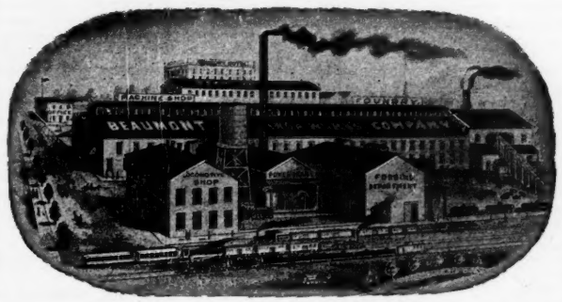

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LEASING SYSTEM DISCUSSED.

Important Strike in Elk Hills—Quiet in Salt Lake Field—Notes.

LOS ANGELES, June 16.—At a luncheon at the Hollenbeck hotel yesterday given to past and present directors of the Chamber of Mines and Oil, Mr. Frank Pierce, former First Assistant Secretary of the Interior, who was the guest of honor, made the statement that those lands covered by withdrawal orders will be developed under a leasing system or not be developed at all.

The discussion of the leasing system brought out many opinions pro and con by those in attendance. Theodore Martin claimed that the system in vogue previous to the withdrawal orders was about right, stating that under the placer mining law the poor prospector had every opportunity to make good and that he would not be benefited by a change in the leasing system.

A letter was received and read from Congressman S. C. Smith of Bakersfield, who was unable to be present on account of sickness, sounding a warning against the leasing system, and stated that President Taft was not unalterably committed to this form

It was suggested by the president that a committee of five be appointed to draft a leasing bill to be submitted to the membership and to the oil men generally throughout the State.

Mr. Pierce, in a general talk stated that he had cast his lot with Los Angeles and naturally felt a keen interest in the future of this country, which he believes will become the center of mining developments not only of California but of Mexico, Nevada, Arizona and other states and territories, and that the oil fields of this state, in his opinion, are about the richest in the world. His opinions are regarded as most weighty and his remarks were listened to with keen interest.

Bids submitted by Charles T. Leeds, United States engineer, for furnishing 25,000 bbls. of fuel oil for the dredge at San Pedro were awarded the Union Oil Company at 68 cents a barrel. The Standard Oil Company's bid was 75 cents. The specifications called for the oil to be delivered at the water front in the harbor, and the Standard bid on delivering on board the dredge. The government has a small oil barge, auxiliary to the dredge, and this can be towed to any wharf and the oil allowed to run into it from tanks. This is why the specifications call for delivery at the water front and not on board the dredge.

The Provident Midway Oil Company at Santa Paula is 1,212 feet and making slow progress on account of passing through rock formation. A crooked hole necessitated filling up with rock, but the trouble has been overcome and the hole straightened.

The Piru Monarch Oil Company, operating one and one-half miles northeast of Piru, Ventura County, on 150 acres, has issued new series of stock and will drill 10 additional wells. The company is composed largely of employes of the Santa Fe railroad and has one well producing at 1,500 feet and one drilling now 700 feet. The oil produced in this territory is of very high gravity and said to command $1.25 per bbl.

The Midway Northern Oil Company well No. 1 is showing for a large producer, its output now averaging about 1,000 bbls. a day. The oil is 23 gravity and is being taken by the Standard Oil Company. The company's No. 2 is expected to reach the pay sand in a few days.

Well Abandoned.

Slocum Bros.' well near Piru, Ventura county, has been abandoned and the casing pulled. There was much hope that this well would be good, as considerable territory would have been proven up. While there seems to be the best indications, oil bearing strata having been passed through repeatedly almost from the start, only seepages were encountered and small pockets of oil found which were soon exhausted. They are moving material into the northern part of section 9-4-20, at La Breche canyon, near Santa Paula, and will start a well there.

The Sunset and Midway fields are undergoing a siege of stagnation so far as new work is concerned and many drillers are taking holidays in consequence. Few of the companies that were busy a year ago are planning new work. Companies signed up with the Standard are about the only ones who see any incentive in pushing operations, and these are going right ahead as though nothing had happened.

The Pluto Oil Company, Devils Den, has resumed drilling again, after a shutdown of some duration. Little else is doing in this locality.

Presents Quiet Appearance.

The Security Oil Company well, section 8-20-15, Coalinga, brought in a few days ago, is producing about 200 bbls. a day.

Many companies are closed down in the Coalinga field, on account of nonremoval of oil, and as a result everything presents a Sunday appearance in this once energetic field. While there are something like a hundred wells drilling most of these are by the large companies, who are not particularly affected by storage conditions. It is claimed by the secretary of the Producers Agency that the production for the past month will exceed the month previous. In fact of the fact that many of the older companies have been shut down for more than a month this does not look encouraging for their resumption for a long time to come.

The Midway Premier, in section 5-32-23, which was one of the gushers making as high as 20,000 bbls. a day six months ago, continues to make a production of 800 bbls. a day. The oil has all been cared for by the Standard Oil Company. All the wells in this section have held up remarkably well, it being considered one of the best sections in the Midway.

In section 19-31-23, North Midway, the Midway Royal Oil Company brought in a well last week which is conservatively estimated at 500 bbls. a day. The location is due north from Fellows about two and one half miles, and is considered of much importance as extending the field north. The sand was struck at 2,775 feet and the well finished at 2,915 feet.

Good Strike in Elk Hills.

A most important strike is reported from the Elk Hills by the Associated Oil Company, which brings good cheer to several companies that have been drilling for months. It is in section 30-22-24. The sand was entered at 3,100 feet, when a tremendous flow of gas and oil resulted. No estimate is made of the output as the well was not under control. Two miles from this strike on section 12-31-24, the Midway Valley Oil Company is 3,300 feet deep, while across the valley the Greene & Hutchinson people have been awaiting the outcome of the well, suspended at 3,100 feet. The strike will stimulate operations in this field.

Tank Car Shipments.

The Lakeview Oil Company is occupying most of the carrying capacity of the Producers Transportation Company's pipe line at Sunset, and 7,000 bbls. per day are being furnished the railroad by tank cars from McKittrick by the Associated. Little oil is being moved from Coalinga for the reason it is stated that there is no means for moving the oil after reaching tidewater. The Union is moving a small portion of Agency oil from Kern river, but this as a rule is all going into storage. Standard runs and shipments are taxed to their fullest capacity with a tendency toward increasing storage.

Working on Refinery.

The Standard Oil Company is making progress on its refinery at El Segundo. The company is perfecting plans for much development work in the southern fields. Its offices in the Higgins Building are growing constantly as aditional forces are being added. Material is being concentrated at different points for pipe lines, and indications point to great activities in the way of pipe line construction, tank building, while a number of wells will be drilled on the new leases in the La Habra valley, two having already started.

IN THE CALIFORNIA FIELD.
Central Oil Company's Property in the Whittier District.

Quiet at Salt Lake.

Operations in the Salt Lake field are at low ebb. No new rigs have been erected for weeks. There are 11 wells drilling with no immediate prospect of finishing. The Belle Vernon well, near Sawtelle, which is the main hope of extending developments west, is now about 2,800 feet deep, with little encouragement. It was stated by one of the owners that the well would not be drilled much deeper and but little hope is entertained of finding the pay sand.

A. F. Gilmour is drilling but one well on his lease of 250 acres. There are many locations to be drilled on and all are productive, but it is the intention of Mr. Gilmour to keep production within the limits of market demands. He has a local market which he supplies with tank wagons and also a contract with the Union Oil Company for a stipulated amount which is supplied each month.

The Grador Oil Company, operating on the west side of the field during the past two years has dismantled its wells and sold out the junk. The company had drilled three wells and were losers to the extent of about $150,000. Although some oil was found, the nature of the formation was such as to preclude the possibilities of profitable operations.

The field is a has been, so far as new work is concerned, although its present output, amounting to about 250,000 bbls. a month, will probably be maintained for several months to come. Like the old Los Angeles city field, the wells are remarkable stayers.

The tense interest shown in the Fullerton field has somewhat abated since most of the available oil territory has been bought or leased. Some new material is being hauled into the field, some rigs are being erected and grades made. A long time will necessarily elapse before results will come from these locations. In the Coyote Hills, while the territory is considered good, few operators have the nerve to tackle a proposition requiring years of drilling to complete a well, so there is little prospect of new work starting here, especially till such time as the Union, C. V. Hall and the Murphy Oil Company have finished their wells. The Whittier Demoine well, which has been drilling over two years near the Coyote Hills, bids fair to continue drilling for several weeks to come, and the Shaffer Bros.' well, another prospect, it is understood, has been abandoned, the boys failing to get stockholders to come through with enough money to proceed with developments.

C. H. G.

GASOLINE SAFETY STANDARDS.

By Col. B. W. Dunn, Chief of the Bureau of Explosives, Washington, D. C.

It has been suggested that a statement from me would be useful to your readers who are interested in the safe transportation of casing head gasoline now being described as "Liquified Petroleum Gas." Many of the shippers of this product are not as well informed as they should be in regard to its characteristics and they fail also to appreciate that Section 235 of the Act of Congress of March 4, 1909, requires them not only to have this information, but to transmit it to the common carrier in interstate commerce to whom their shipments are offered. For violations of this act the penalties are severe; a fine as great as $2,000 and imprisonment for as much as 18 months may be imposed. When death or bodily injury of any person is caused by accidents in transportation of dangerous articles, the penalty is imprisonment which may last for as much as 10 years.

It has been customary to gauge the volatile nature of such liquids as gasoline by Baume gravities. On this scale 86° gasoline is about as high as this liquid has been produced in any appreciable quantity by the old refining methods. The grades of casing head gasoline vary in Baume gravities very much. Some of them have gravities less than 86° and there is no very well defined upper limit for these products. We hear of gravities as high as 105° and of anticipation of still higher gravites. The producers of the lower grade can be excused for the conviction that their products should not be differentiated from refined gasoline of similar gravity. The producers of the higher gravities may not appreciate thoroughly how much they have endangered the reputation of the product as a whole by rushing into the use of more and more compression to produce the highest possible grades of this liquid, and the shipment of these high grades in containers not suitable for this dangerous service.

The St. Louis Accident.

The unfortunate accident at St. Louis was a forcible reminder to all concerned. A tank car of old construction was used in this case to ship a liquid that showed a Baume gravity of over 90° in the remnant left in the car after the fire. The condition of the safety valve setting on this car when shipped is not known. After the fire one valve opened at about 13 pounds and the other at one pound. It is reasonable to assume that the effect of the fire altered materially the spring tensions by drawing the temper of the springs. It is true that good judgment does not seem to have been shown by the men in charge of the car at the time of the accident; they were endeavoring to obtain from the car a sample of the liquid and to do this they unscrewed the dome cap. There was evidence of interior pressure in the tank which should have suggested the advisability of not unscrewing the cap until this pressure was released or the vapors condensed by using a hose to throw cold water over the car for an extended time. We must appreciate, however, that bad judgment was not the only cause of the accident. If the car had not contained a liquid capable of producing unusually high pressure, the bad judgment would not have caused the accident.

It is the duty of the writer as chief inspector of the Bureau of Explosives to safeguard the transportation of dangerous articles. While safety must be given the first consideration, it is naturally his desire also to interfere with business as little as possible. It was necessary for him to call the attention of railway officials generally to this accident at St. Louis and to the fact that liquified petroleum gas as a class is more dangerous to transport than refined gasoline. Those manufacturers of the new product who attended the conference called by the writer at Pittsburg, May 26, 1911, have, it is believed, a clear conception of the reasons for all steps taken to date and by resolution at that meeting approval was given to the recommendations of the writer as reasonable steps to take pending the completion of our scientific investigations and the drafting of final rules for safe transportation.

Proclaimed Regulations.

In a supplementary circular letter on this subject railway officials have been informed that the following represent the precautions to be taken for the present:

1. To be acceptable in tank cars, the cars must be in good condition complying with M. C. B. rules, and the liquified petroleum gas in them must have been properly blended with a heavier grade of naphtha to form a mixture whose gravity on the Baume scale does not exceed 76°, the shipper to furnish a special certificate to the receiving agent to show compliance.
2. When not blended with heavier naphtha, the liquified gas, after proper "weathering treatment," will be accepted in good steel barrels. These barrels must not exceed 55 gallons capacity, must be made of not less than 16 gauge metal and should weigh when empty not less than 80 pounds.
9. Gasoline made by refining petroleum, or by the vacuum process, is not affected. It should be accepted subject to existing requirements.

It has been questioned by several parties whether we can be sure that the vapor tension of a blended 76° product can be permitted in tank cars. It is true that my data on this point are not yet complete, but as far as they go they indicate that the vapor tension from this blend when properly made will not cause the safety valves on tank cars to "blow." If we find on further investigation that this blend will cause these valves to "blow" it will be necessary, of course, for further restriction to be made. It must be realized by all that it is unsafe to have vapors of such an inflammable liquid as gasoline escaping through the safety valves of tank cars in transit on our railroads. It would be comparatively easy to ignite these vapors by sparks from the engine, or fire from other sources, and it is not pleasant to contemplate the possible results of such ignition. A still more serious possibility is that there might be a sufficient escape of these vapors in some tunnel to form an explosive mixture with the air in the tunnel. A mixture of 10 per cent of the vapors with 90 per cent of air will form a very dangerous explosive mixture and the ignition of such a mixture in the tunnel through which a passenger train is passing would cause a great disaster.

Weathering Prescribed.

The "weathering" treatment prescribed must not be neglected. It is well known that weathering means loss of product and the temptation to the producer not to allow the escape of what he has spent his money to condense is always present. When asked to define what should constitute weathering treatment, one well-informed producer suggested that a tank with 100 barrels capacity should have an open vent not less than two inches in diameter and the material stored in the tank should be allowed to weather for not less than 24 hours. Tanks of different capacities should have open vents of correspondingly larger or smaller area. Speaking generally, the object of the weathering is to bring the liquid down to a practical constant condition. Determinations of Baume gravity will enable the producer in any case to know when this practically constant condition is attained. The object of the weathering, of course, is to permit the escape of practically all of the non-conden-

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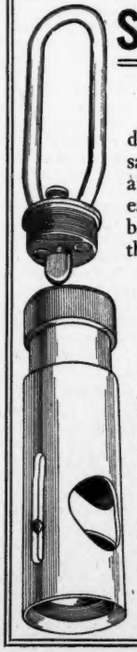

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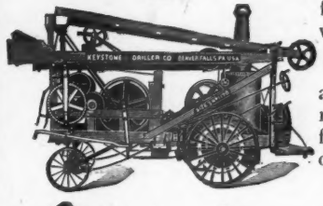

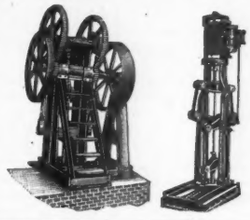

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sable gases imprisoned in the liquid as it comes from the compressor.

Some objections have been registered to the use of the description "Liquified Petroleum Gas." It is claimed that this product will ultimately be divided into two classes, the lower grade corresponding in all respects to refined gasoline, and for such material the description "Liquified Petroleum Vapor" has been suggested; for the higher grade no objection is urged to the name "Liquified Petroleum Gas." The writer has no objection to this contention from a theoretical standpoint, but is of the opinion that, until we are able to thoroughly differentiate the two products, safety requires that we must regard them all as dangerous and use the descriptive term that is the best indication of this danger. The same principle has always been recognized in handling other dangerous articles. There are many explosives for example less dangerous to handle than dynamite but for shipping purposes they must all be described under the law as "High Explosives."

Important Result.

The most important fact resulting from the investigations already made by experts is that for safe transportation we must know the vapor tension or interior pressure in pounds per square inch that will be produced in shipping containers at some standard temperature high enough to cover reasonably the most dangerous condition, say 110° Fahrenheit. The Baume gravities of liquified petroleum gas do not indicate this vapor tension. The vapor tensions of two grades of gasoline of the same gravity, one refined and the other the new product, do not differ materially, but such difference as exists show the tension of the liquified gas to be higher.

The first thing to be done then by all shippers and producers of this new product is to determine exactly what the vapor tension is for their different products at 110° Fahrenheit. The Bureau of Explosives is willing to do all it can to assist in getting this information. A number of inspectors have been equipped with the necessary apparatus for measuring vapor tensions and they will visit the producing plants giving their attention first to those points where tank car shipments are made. The only points furnished me to date as tank car shipping points are the following:

Henry Farm Oil Company, Warren, Pa.: the Petroleum Products Sales Company, Marietta, O.; James B. Berry's Sons Company, Sistersville, W. Va.; Riverside Oil Company, Sistersville, W. Va.; James B. Berry's Sons Company, Follansbee, W. Va.

If there are other points information should be furnished the writer at once.

Limit of Safety.

When a rule is finally prepared to cover safety it is admitted that the wording of the rule should be general and it should not be made to apply specifically to one product any more than to another. We must decide on the maximum vapor tension that we can permit in a tank car and frame the rule to prohibit the shipment in such a car of a liquid that gives a higher vapor tension. Ten poinds per square inch at 110° Fahrenheit is now being considered tentatively for this limit.

There is another very important point in connection with the shipment of this and similar liquids in tank cars. Many of the tank cars now passing over our railroads are not suited to this dangerous service. A standard must be fixed as soon as practicable for a tank car for this service and the responsibility placed on the carrier, as well as the shipper, to see that the public is not endangered by the use in this service of a tank car below the standard. The same problem was presented in framing the regulations for the transportation of explosives issued by the Interstate Commerce Commission. These regulations fix this standard for a box car to carry dangerous explosives. Wherever a box car is placed in this service, as shown by the rectangular shaped explosive placard on its sides and ends, an observer will also notice on both sides a certificate that has been signed by the carrier and the shipper, and this certificate is evidence of the fact that the box car is up to the prescribed standard. I would like to see, ultimately, the same plan adopted for tank cars containing any kind of gasoline, benzine, naphtha, carbon bisulphide, etc. If the 10-pound limit is finally selected, no liquid, whatever its name, that gives a higher vapor tension, should go into such a car. I am quite sure that 10 pounds are sufficiently high for this limit under the present M. C. B. rules for setting the valves of tank cars. Safety alone would suggest that the limit be lowered to seven pounds to insure no possibility of "blowing" of these valves.

Apparent Safety Only.

It has been urged that it would be safe to increase the valve settings on these cars in order to transport in them liquids having vapor tensions considerably higher than 10 pounds, possibly to 20 or 30 pounds, per square inch. On this point, it is true, that a tank car tested repeatedly by a hydraulic pressure of 60 pounds, and built to have a rupturing strength of 260 pounds per square inch, ought to be safe against explosion under ordinary conditions when the interior pressure is not higher than, say, 30 pounds. By setting the valves at a point above 30 pounds, the maximum vapor tension in transit, it would seem to be safe on first consideration; on the other hand, we must remember that these safety valves are used to prevent explosion of these tank cars if they should happen to be caught in a hot fire. The area and the tension of the valves have resulted from expensive experiments in which cars filled with about 72° gasoline were subjected to fire.

If we disturb these valve settings we must first go over this experiment field again and see whether explosion is prevented when the more volatile liquids, with the higher valve settings, are involved. The same size of car and the same kind of a fire would, in the second case, produce a much more rapid evolution of vapor, and the difficulty in securing release of it through the valves would be materially greater. Taking everything into consideration, it is the writer's opinion that we must not expect, in the near future at any rate, any decision to permit higher valve settings on these cars, and we must therefore make our plans to keep out of the cars any liquid that will give a pressure in excess of these settings.

When a tank car cannot be used the next container is a metal barrel. There are many types of cheap metal barrels that experience shows to be less effective even than good wooden barrels, and for this liquified petroleum gas nothing but the very best types of metal barrels should be used. It is for this reason that we have specified that the barrels of 55-gallon capacity must not be made of less than full 16-gauge United States standard, and the empty weight of the barrel must not be less than 80 pounds. This is less than the empty weight of any type of barrel tested by the Bureau of Explosives and found to be up to the standard fixed by the following specifications presented to the Interstate Commerce Commission: Regulations for the Transportation of Dangerous Articles Other Than Explosives. Shipping Container Specification No. 5. Iron or Steel Barrels or Drums for Inflammable Liquids (Paragraph 1823), Mixed (Nitrating) Acids (Paragraph 1858A): Approved ——, 1911; Effective ——, 1911:

1. An iron or steel barrel or drum, with a capacity of from 50 to 55 gallons, must have a minimum weight, in the black, exclusive of the weight of rolling hoops, of 70 pounds; and the minimum thickness of metal in any part of the completed barrel must not be less than that of full No. 16 gauge, U. S. standard. When the capacity of the drum or barrel is less than 30 gallons, the minimum thickness of metal must not be less than No. 18 gauge, U. S. standard.
2. An iron or steel barrel or drum, with a capacity of from 100 to 110 gallons must have a minimum weight in the black exclusive of the rolling hoops, of not less than 120 pounds and the minimum thickness of metal in any part of the completed barrel or drum must not be less than that of full No. 14 gauge, U. S. standard.
3. Each barrel or drum must be tested by its manufacturer under water by interior compressed air, at a pressure of not less than 15 pounds per square inch sustained for not less than two minutes, and the type of barrel or drum must be capable of standing, without any serious permanent deformation, a hydrostatic test pressure of not less than 40 pounds per square inch sustained for not less than five miuntes. No leaks must develop in either test.
4. When filled with water to 98 per cent of its capacity, the type of barrel or drum must also be capable of standing without leakage, a drop on its chime, from a height of four feet upon a solid concrete foundation.
5. Bungs and other openings must be provided with secure closing devices that will not permit leakage through them. Threaded metal plugs must be close fitting and gaskets must be made of lead, leather or other suitable material. Wooden plugs must be covered with a suitable coating and must have a driving fit into a tapered hole.
6. The method of manufacturing the barrel or drum and the materials used must be well adapted to producing a uniform product. Leaks in the new barrel or drum must not be stopped by soldering, but must be repaired by the method used in constructing the barrel or drum.

Larger Containers.

Some inquiries have been received in regard to the use of 110 gallon drums for this service. If such a drum has the strength of the good 55 gallon barrel, no good reason can be given for prohibiting its use. Unfortunately, however, most of these 110 gallon drums are second-hand glycerine drums with riveted heads and careful tests have shown that these glycerine drums do not possess even approximately the strength or resistance to leakage of the 55 gallon barrel. These riveted seams also are very liable to allow escape of such a volatile liquid as liquified petroleum gas even when the drum does not rupture. It must be remembered that these drums were made originally to carry a thick viscuous liquid such as glycerine without any interior pressure. They are very good for that purpose, but they are not suitable for the thin and volatile liquids. If any producer of this new product has 110 gallon drums made in this country by the same methods used for the good 55 gallon barrel and made of metal not less than full 14 gauge U. S. standard, it would be in order for such a producer to ascertain by testing these drums whether they will meet the specifications. To do this, they should show no leakage under 15 pounds per square inch air pressure tested under water, the pressure held for two minutes, and no leakage under 40 pounds hydraulic pressure maintained for five minutes. This is the minimum standard. We ought to be able to carry this pressure up to at least 100 pounds per square inch without leakage. The drum should also be capable of standing, when filled to 98 per cent capacity with water, a drop on a concrete floor from a height of not less than four feet. It ought in reality to stand a number of such drops on its chime. The chime will be deformed, but it ought not to leak.

It is earnestly recommended that all producers of this new product should provide their plants with apparatus for measuring vapor tensions and should immediately have made a large number of such measurements. All data of this kind should be transmitted at once to "The Chief Inspector, Bureau of Explosives, 30 Vesey Street, New York City." Care should be taken to describe accurately the sample for which the vapor tension is given, the name of the well from which produced, the kind and extent of weathering treatment given it and the Baume gravity when known. Wherever blends of this new product with lower gravity liquids have been made, vapor tensions should be measured for the blend. Samples should be taken from different parts of the container and the measurements repeated on different days to determine whether these blends are really true mixtures or whether the vapor tensions given by them may result from the lightest ingredient.

By adopting this suggestion and working zealously to co-operate with all concerned we should soon be in possession of the facts we need so much.

In closing this letter I wish to express my thorough appreciation of the great value of this new industry and my desire to avoid subjecting it to any restrictions or inconvenience not absolutely essential for the promotion of public safety.

HOW TO SHIP GASOLINE.

Producer-Operator Gives His Views of the Transportation Question.

Editor Journal:

In conversation with Mr. T. D. Collins of Nebraska, Forest county, Pa., a few days ago, he requested me to write you concerning my views of handling casing head or natural gasoline in tank cars and steel drums. For the past six years I have sent out an average of 10,000 gallons of this product per month to almost every state in the Union, also considerable in drums to Canada.

I built the first high-pressure compound plant at Mayburg in 1905, and have been manufacturing and shipping ever since under my personal supervision, except in the last twelve months, when I was laid off by sickness.

Safety Valves Proposed.

In all new cars for the shipment of gasoline I believe there should be a special top on all domes, designed for a lead gasket that can be thoroughly caulked and kept tight, no matter how long the journey. Such a top I have long had in mind. I have always objected to the large safety valve, such as we find on the tank cars in present use. That is, I object to the large valve opening at once to let out all of the gas in so short a time. To do so is certainly very dangerous. I have designed a tank car, on which is a cage, in shape very similar to the valve in use now, only I use four smaller pop valves—one set at 10 pounds, one at 15, one at 20 and one at 25 pounds. Under ordinary circumstances the 10-pound valve will handle the overpressure, and in an emergency the four valves would act as the pressure rose and give relief enough to keep the tank car from blowing up. They will also take care of any change of pressure that may take place in switching or coupling cars or slacking of speed, by which the fluid may have a tendency to rush to one end and strike a blow on the end of the car, and thus cause a rise of pressure inside, thus assuring us at all times a small waste of gas, and yet ready in an emergency to take care of any pressure that may arise.

Danger from Ignorance.

I have never had any trouble with high pressure in the transportation of natural gasoline. We have had some outage in the summer time, but not enough to indicate a steady high pressure. There is more danger of high pressure on the switch than there is in the car in transit. The winds, either natural or from the motion of the car, keeps it comparatively cool even in summer. The loading of cars is not very dangerous, because it is mostly done at night, or on cool days, and the tank car closed before the heat of the day. The danger is at the other end. A tank car coming in, switched from the yard, where maybe it has been for a day or two, hot and considerable pressure inside, is just in shape to cause trouble unless very carefully handled.

None but men who are thoroughly alive to the danger should ever touch a car of this kind. First, it should be put in a cool place until morning. If it still shows pressure it should be thoroughly drenched with cold water until the pressure goes down, then the cap of the dome can be unscrewed safely and the car unloaded.

The St. Louis Accident.

The trouble with the St. Louis car was it was hot high pressure. When the cap was taken off it flowed gas and gasoline, and being near fires the result was an appalling disaster. The toll was human life and the destruction of property, and an awakening of the whole nation to the necessity of getting the matter under control. I think it was right to get it in hand, yet we must remember that this same gasoline has been sent all over the country for nearly six years, but it fell into careful hands and no loss of life. The

St. Louis tank car was shipped by my son and son-in-law, Richards & Card, of Henry's Mills, Pa. The packing must have held, and the tank car as far as the holding of the product was concerned, was perfect, or there would not have been any pressure inside of it, and no flow of gas or gasoline. The very nature of the stuff is to flow when it is hot.

As an illustration, when we pull tubing from an old well there is, say, 500 or 600 feet of crude oil in the bottom, unless the lower valve is pulled first. After taking away a few joints of the tubing after this oil is reached, the gas below feeling the lightening of the load will begin to push up and the tubing will flow the oil out of it, sometimes throwing it high above the top of the derrick. It is on this same principle that a tank car will flow, but it will relieve itself quicker as the opening is larger and the body of the tank larger, and it will half empty itself. If near fires or lights we have a St. Louis horror.

Safety Valves.

In the construction of the P. R. R. tank cars it is very unfortunate that there is no way to lift the valve, and unload from the bottom. (Until you have unscrewed the cap on top of the dome this is the real trouble.) In my design a valve stem goes up through the top of the dome through a stuffing box. The top of this stem is made square, so that it can be turned by a wrench. Inside the dome is a cross bar with a female thread—a male thread is put on the valve stem, and this will lift the valve with perfect safety. The cap on the outlet has a two-inch hole in it with pipe thread. This can be coupled to pipe or hose and conducted to the receiving tanks, the valve lifted and say ten or fifteen barrels of the gas and gasoline let out if there is pressure inside the tank. This will relieve it without further trouble. The plug that screws into the hole in the cap is secured by proper appliances, so that there is no danger in transit.

I have also a different device for operating the valve from the side of the dome; so that if there is any objection top of the dome this design will remedy that. Owners of tank cars may use either as they may think fit, or such other designs as may be thought better adapted to secure the same end—safety in unloading high-gravity gasoline.

We must not be led into the conclusion that any device that may be adapted will give us perfect freedom from accidents, for no matter how perfect the device, it must be the brains that operates it at any given point that controls the situation. A uniform and perfect device will help. I have shipped many carloads of steel drums or barrels and have thought that the ideal way to ship natural gasoline. The loss is some greater, but it is on the line of weathering the product, which allows it to reach its destination in better condition. The protection of the roof and sides of the box car is a help, and the matter of units, if one or two is broken, is a small matter compared to a tank car. Even in a wreck it is not likely that every unit of a car of steel drums would be broken. I never fill them full, but allow two inches for expansion, which so far I have found to be enough. Drums with all the openings at one end are the best—one two-inch and one one-half inch. The half-inch can be loosened to find out if there is any pressure in the drum, and if so it can be worked off without taking the small plug out altogether. It is also my opinion that tank cars such as is furnished by the P. R. R. are heavy enough if the internal pressure is provided for by a series of valves that will take care of it in every emergency. The arrangement of my valves places them out of the reach of anyone, so that they cannot be locked or tied down.

WILLIAM RICHARDS.

Mayburg, Pa., June 19.

The New England Fuel Oil Company, of Portland, Me., has been incorporated for $200,000, by H. V. Knight, J. M. Walsh, Boston, Mass.; E. W. Freeman, E. M. Wall and J. M. Walsh, Portland, Me.

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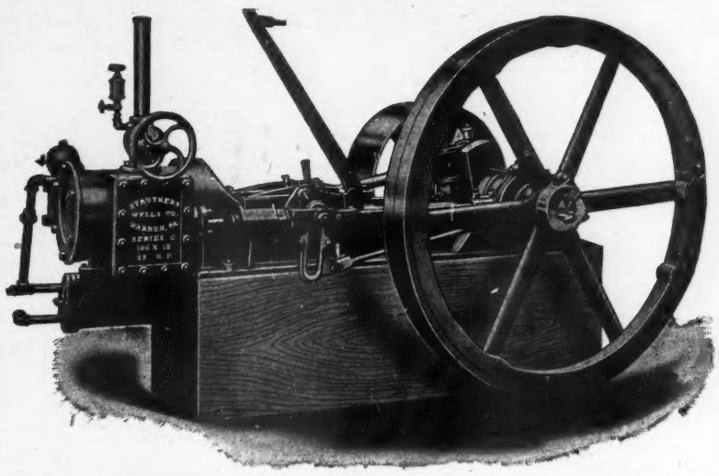

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GAS—LIGHT, FUEL AND POWER

PITTSBURG STOCK MARKET.

PITTSBURG, Pa., June 20.—(Special.)—The past week shows a fair volume of business in the oil and gas securities on the local market, nearly 9,000 shares changing hands.

Another stock has applied for registration on the local exchange, Ohio Fuel Oil being the latest to fall in line. A dividend was expected on this stock on the strength of its statement and when it failed to materialize, the stock weakened to 6½ but has since rallied to 6⅞. No dividend is expected before fall and the company may retire the $400,000 worth of outstanding bonds before cutting into the profits. Shares were traded in to the extent of 1,120 shares and closed with 6⅝ bid; offered at 6⅞. Ohio Fuel Supply was entirely neglected and failed to register a sale during the week. Closed today with 41½ bid; 42¾ asked. The bonds were also quiet, $1,000 selling at 99 and $500 today at 98½. 98¼ bid and 99 asked at close.

Pure oil showed increased activity yesterday when 100 shares sold at 9½ the high mark for this stock. The crowds are still bullish on it and $10 a share is fully predicted. 5355 shares were on the markets and it gained 1⅛ points on the week, the last sale being at 9¼. Closed 9 bid; 9¼ asked.

Oklahoma has been active and is 100 stronger at 158. This stock could sell at 60 and not be crowded. Osage & Oklahoma retired their entire first mortgage issue of bonds and now have only $125,000 2nds outstanding. The stock is in demand around 23.

There were small sales of Dominion around 119½. We still feel that this stock is a good buy, netting over 10% on present prices. Quoted nominally 118 to 120.

Manufacturers Light & Heat was weaker, selling off from 22⅛ to 21½ and each to 21¾, 1,680 shares on the market. Closed with 21¾ bid; 21⅞ asked.

Union continues to hold its advance and was steady on small sales at 140. Unless there is a move soon it will be impossible to get gas into Detroit this winter.

Oklahoma bonds, dated 1913, sold $5,000 worth at $100, the first sale in some time.

Kansas is stagnant at 21 to 22. Wichita continues nominally, 38 to 40 with no sales.

Arkansas is quiet at 15 bid; 20 asked. The short term bonds of this company are attractive at present prices.

Quapaw (1913) 63 bonds with 100% stock bonus, are offered at 101 and are a good buy since completion of Hogshooter line. J. O. JR.

OHIO GAS NEWS.

Heisey Gas Company Sells to the Logan Natural Gas Company.

AKRON, O., June 17.—(Special)—The gas question at this season of the year resolves itself into one where the large producers and suppliers of gas have no cause for undue hilarity. Especially is this true in various cities of Ohio, where the supply is diminishing and a large outlay is necessary to keep up the production. During the summer months the consumption falls off, causing a decrease in the income, and it is at this season that the companies have to look forward to an increase for the winter demand. The Ohio Fuel Supply Company is very active securing leases, and is adding much prospective territory to its rental list. The supply for a number of Ohio cities comes from the West Virginia side of the river, and while people generally are not informed as to the outlay in piping gas to towns on the Ohio side, they are prone to fight the gas companies on the question of rates. As one producer put it, "the gas companies went in at the big end of the horn in the natural gas industry several years ago, but there is only one port of exit, and that is at the little end." The managers of the gas companies have responsibilities resting in their efforts to make a fair return to the people who have trusted them with the investment of their money. The gas question is not very well understood, and a wail can be heard any time that the consumer who is being charged 25 cents per thousand feet is being robbed, where if he had to use the manufactured product, he might be doing like they are in Chicago at present—trying to get it down to 77 cents.

In Akron there are two companies supplying the town, the East Ohio Gas Company and the Mohican Gas Company. The Mohican is doing no work at present, but will start up actively in the fall, while the East Ohio is also taking things easy. In Penn township, Morgan county, late developments show for an extension further east toward the river in the shallow sand territory.

Large Central Ohio Deal.

A deal was consummated last week in which the Logan Natural Gas and Fuel Company purchased the property of the Heisey Gas Company in the central Ohio field. The property is located in Ashland, Lorain and Cuyahoga counties, consisting of 27,000 acres of leases, with four producing gas wells in Ashland county and four drilling wells. The property is centrally located in the heavy producing gas belt, and while the consideration has not been made public, it is thought the property brought a large sum. The Logan Natural Gas and Fuel Company holds leases on about 400,000 acres in the central Ohio gas area, and the purchase of the Heisey property makes it one of the largest holders in the field.

Ashland County Holds Up.

The results in Ashland county of late have been very gratifying, and it is now considered the most promising territory in the central Ohio field. In Mifflin township, the Medina Oil and Gas Company, allied with the Columbus Natural Gas Company, has a 9,000,000-foot gasser in its test on the Sam Heckman farm, section 1, in the northeast corner of the township, three miles northeast of Petersburg and about five miles southwest of Ashland. In the same township the Logan Natural Gas and Fuel Company has a 6,500,000-foot gasser on the L. R. Gongwer farm. The Ohio Fuel Supply Company has made locations for wells on the Phillip Culler, A. Barr, J. Kreiger, J. Zehner, J. J. Gongwer and B. Brubaker farms, same township.

In Vermillion township, Ashland county, the Logan Natural Gas and Fuel Company got a good one on the Henry Sheller farm, section 6, about a mile east of the Heckman farm well. It made 10,780,000 cubic feet. Nos. 4 and 5 are drilling on the William Sheller farm, section 6, on the property purchased from the Heisey Gas Company.

The Medina Oil and Gas Company's well on the F. Mohrman farm, southeast of Ashland, in Montgomery township, made 2,000,000 cubic feet, and the same company has a rig up on the F. England farm, just south of Ashland. The Logan Natural Gas and Fuel Company's No. 1 on the L. Shambaugh farm, made 3,000,000 feet. The company is drilling a test on the R. E. Ferguson farm, just south of Ashland. The Ohio Fuel Supply is putting up rigs for tests on the T. J. Elliott, B. Smith and G. Dickey farms, in the same township.

The Heisey Gas Company has a test under way on the Swineford farm, in Milton township.

In Litchfield township, Medina county, the Logan Natural Gas and Fuel Company, has No. 2 drilling on the A. R. Stranahan farm, on which it drilled an oil well about a year ago; also a drilling well on the J. M. Yost farm, same township. This same company has a test drilling on the John Jason farm, in Westfield township, same county.

The Underwood Company is drilling a test on the F. M. H. Seibert farm, in Medina township, while in Lafayette township, same county, the Ohio Fuel Supply Company made a location for a test on the F. Sedgwicks farm.

Wildcat Wells.

One of the important locations made the past few days for a wildcat venture is the Ohio Fuel Supply Company test on the E. Emmons farm, in Columbia township, Lorain county, and the farthest to the north of any test yet made the past few years in the central Ohio area. In Wayne township, Wayne county, the Ohio Fuel Supply Company made a wildcat location on the J. Beachey farm. A. M.

AGREE TO GIVE TITLE.

Favorable action by the first mortgage bondholders of the Manufacturers Light and Heat Company will permit the trustee, the Union Trust Company, to give title to the property sold to the Hope Natural Gas Company in West Virginia last year. The consideration was approximately $1,000,000, and the purchaser stood ready to pay the amount involved, but the Manufacturers Light and Heat Company could not make use of the money, as the provisions of the mortgage under which the first mortgage bonds were issued in 1903 were such that the trustee's consent could not be obtained unless some acceptable proposition was presented which would give the bondholders additional security in place of the property disposed of. The special committee appointed at the last annual special meeting of the stockholders, when the bonding scheme was defeated, consisting of George W. Crawford, S. Y. Ramage and A. C. Warne have been working on a scheme for the readjustment of the indebtedness.

The consent of 66⅔% of the holders of first mortgage bonds has been secured to give the required title to the property sold. The proceeds will be used in paying off the $871,000 Wheeling Natural Gas collateral trust bonds and in reimbursing the Hope Natural Gas Company for constructing a pipe line at the cost of $250,000. The difference will be paid out to the treasurer of the Manufacturers Light and Heat Company. The 55,702 shares of the Wheeling Natural Gas Company, released by the payment of the bonds, will be deposited with the trustee as additional security for the first mortgage bonds, the amount outstanding now being $3,300,000. The company will pay off the final installment of $100,000 of the 6% bonds of the Fort Pitt Natural Gas Company on June 30, and on January 1 will pay $50,000 of the remaining $200,000 of the original issue of Manufactuers Light and Heat bonds.

GAS IN UNITED KINGDOM.

At the close of 1910 there were 1,255 gas undertakings in England, 263 in Scotland, 120 in Ireland, 135 in Australasia, 52 in Canada, and 15 in other British possessions. There were also 20 British companies owning gas works on the continent and in other parts of the world. In England 1,029 gas works were owned by companies and 226 by local authorities; in Scotland 206 by companies and 57 by local authorities, and in Ireland 85 by companies and 35 by local authorities. The production of gas in England in 1910 was 176,493,540,000 cubic feet; in Scotland 16,593,455,000 cubic feet, and in Ireland, 5,596,738,000 cubic feet, making a total of 199,083,733,000 cubic feet, compared with 194,464,593,00 cubic feet in 1909, distributed among 6,501,273 consumers. Of this total, municipal gas works supplied 68,193,721,000 cubic feet to 2,623,222 consumers, or 34.2 per cent of the total quantity among 40.3 per cent of the consumers. Of the gas made in Scotland, 83.6 per cent was made in municipal gas works, 29 per cent in England, and 49.5 per cent in Ireland, the last figure being mianly due to Belfast having a municipal supply.

The number of gas consumers in the United Kingdom increased in 1910 from 6,388,511 to 6,501,273, the new consumers largely using slot meters, the number of which advanced from 2,867,466 in 1909 to 3,084,503 in 1910. The number of gas cooking stoves in use in the United Kingdom in 1910 was 2,747,671 compared with 2,575,511 in 1909. There were 754,930 street gas lamps in the United Kingdom in 1910, of which nearly 82 per cent were fitted with incandescent burners and mantles. The price of gas to private consumers throughout the United Kingdom averaged in 1910 about 70 cents per 1,000 feet.—Daily Consular and Trade Reports.

ANNUAL MEETING HELD.

At the annual meeting of the stockholders of the Independent Natural Gas Company held recently at Pittsburg, Pa., the following officers were elected for the ensuing year: John A. Beck, president; Charles E. Succop, vice-president, and J. H. Friday, secretary-treasurer. These officers with the following comprise the board of directors: W. P. Hansell, S. Zoch, L. L. Wolfe, George J. Schmitt, William B. Hays, D. B. Heiner, Jasper Starr and Judge William Bradley. The secretary's report showed a good financial condition.

The company is now furnishing gas to the towns of Pavilion, Le Roy, Perry, Warsaw, Caledonia and Mumford, N. Y. The company is considering plans for piping Rochester, N. Y., which is only 27 miles from the gas field, and will make application for a franchise. The capital stock of the company is $500,000, the par value being $100.

GAS NOTES

During an electric storm at Shawnee, Okla., June 18, lightning struck the plant of the Shawnee Gas and Electric Company, which was totally destroyed, the loss being estimated at $150,000.

The Honolulu Consolidated Oil Company, of California, is installing a plant for manufacturing gasoline from its Buena Vista Hills' gassers in section 10-32-34. The plant will be running in 30 days.

Secretary Jones of the Natural Gas Association of America, has sent out notice that he is ready to accept orders for the official badge of the association, which was adopted at the last convention.

A gas franchise has been granted to local capitalists at Corpus Christi, Tex., for a term of 25 years. The franchise provides a decrease in the rate in proportion to the amount of patronage accorded the plant.

The council of Wilmington, O., has passed on first reading an ordinance granting to John E. Baumgardner, of Wellston, O., a franchise for piping the city with natural gas. The franchise extends for 25 years and has a maximum rate of 35 cents per thousand.

Work has begun on the city gas plant of Wheeling, W. Va., and rapid strides are being made toward its rebuilding. The engineers have staked off the lines for the generating house and the building will be put up immediately. The dimensions are 86.33 feet by 40 feet.

At a recent meeting of the Mississippi-Alabama Oil, Gas and Mining Company, held at Birmingham, Ala., its capital stock was increased from $500,000 to $1,000,000. The company's holdings are situated above the Fayette county field, and drilling will be started at once.

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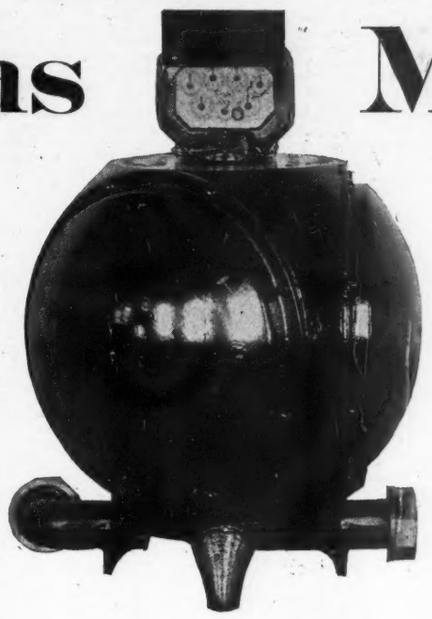

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Official Proceedings Natural Gas Association

Concluded from June 15th Issue

(Discussion on E. S. McClelland's paper, "Machinery Used for Pumping Natural Gas.")

I know the temperature of the feed water was only 178°. They have no economizers connected with the boilers and it is very evident, indeed, that we can constantly improve this record by spending a little more money and availing ourselves of the economies with which we are all familiar. The supplemental report to which I referred in the opening of my remarks is as follows:

Through the courtesy of Mr. Norwood Johnson, sueprintendent of the Carnegie Natural Gas Company, I am able to add as a supplement to Mr. McClelland's paper the final test of the steam driven compressing station he calls attention to.

In describing the station he states that:

"The steam from the receiver is passed through coils in the pathway of the gases escaping from boiler, on its way to the low pressure cylinders." This statement is a mistake as no such device is installed. The arrangement is, however, feasible and increased economy would be derived from it.

It may also be well to state that the plant in question is equipped with two Nordberg cross compound, surface condensing corliss engines, horizontal with a single stage, automatic valve gas compressing cylinder coupled to the piston rod of each steam cylinder. In addition to the gas compressors the following auxiliaries are operated by a rock shaft driven from the low pressure side of each engine:

1—Air Pump.
2—Circulating Pumps, single acting.
2—Boiler Feed Pumps, single acting.
2—Water Jacket Pumps, single acting.
1—Condensation Pump, single acting.

The steam cylinders are unjacketed with the exception of the low pressure cylinder heads, which are jacketed with steam from the receivers. The receivers are provided with reheaters which are filled with steam at nearly the boiler pressure. The steam entering the low pressure cylinders is superheated by this means, from 22 to 30 degrees, according to the speed of the engine. The boiler plant consisting of four Babcock and Wilcox boilers is equipped with superheaters, which furnish steam at the throttle with from 30 to 40 degrees superheat.

The record of the test follows:

Test of Carnegie Natural Gas Company Station at Underwood, W. Va., made April 19, 1911, by H. R. Corbitt.

Six hours test with both engines running.

Dimensions, Common to Both Engines.

Diameter of high pressure steam cylinders	31 in.
Diameter of low pressure steam cylinders	68 in.
Diameter of both gas cylinders	28 in.
Common stroke of all cylinders	60 in.

Revolutions Per Minute: No. 1 engine, 54.547; No. 2 engine, 52.869.

Temperatures, Degrees F.

	Engine No. 1	Engine No 2
Steam at throttle (superheat 37 degrees)	410	410
Feed water entering heaters	103.75	108.32
Feed water leaving heaters	173.88	187.96
Feed water at boilers	178.45	178.45
Air in engine room	74.0	74.0
External air	57.0	57.0
Temperature of gas used for fuel in boilers	55.08	55.08

Pressures.

Steam near throttle (lbs. per sq. in.)	164.72	166.26
Receiver pressure (lbs. per sq. in.)	12.92	13.52
Vacuum measured in exhaust chamber (inches)	25.47	25.17
Barometer (inches)	28.88	28.88
Gas discharge pressure (lbs. per sq. in.)	163.06	162.73
Gas suction pressure (lbs. per sq. in.)	14.42	12.80
Steam pressure at boilers (lbs. per sq. in.)	171.68	171.68

H. P. Developed—Corrected Indicator Springs

Total horse power in steam cylinders	1355.81	1280.38
Total horse power in gas cylinders (B. H. P.)	1237.59	1170.58
Mechanical efficiency — per cent	91.28	91.42

Gas Consumed in Boilers, Cubic Feet: Pressure of gas at burners, ounces, 7.62. Temperature of gas to burners, degrees F., 55.08. Barometer 28.88 inches corresponding pressure, 14.17. Gas burned per hour (meter reading not corrected), 35217.00.

Economic Results—Including all Auxiliaries.

Gas burned per I. H. P. Hr. in steam cylinder	13.36 cu. ft.
Gas burned per I. H. P. Hr. in compressor cylinder	11.63 cu. ft.

Mr. F. W. O'Neil: Mr. McClelland in endeavoring to make out a case for the gas engine has been inconsistent in his reasoning.

On page 70, first paragraph, speaking of the steam plant, he assumes the gas to contain 1000 B. t. u. and at the bottom of the page, in speaking of gas engine performance, he assumes the gas to contain 1043 B. t. u. He also assumes the boiler efficiency for the steam plant to be only 70%, whereas there is no reason why, in a properly operated boiler plant fired with natural gas, the efficiency should not be maintained at 80%.

Mr. McClelland gives the gas consumption of the gas-driven pumping unit, including auxiliaries, at 9.55 cu. ft. per compressor I. H. P. hour at full load, on page 70, but on page 69 he assumes it to be 15 cu. ft. at half load. It therefore seems proper to assume that this is Mr. McClelland's idea of how economies of the gas engine will fall off at fractional loads. The steam-driven compressor will, on the other hand, maintain a high economy at fractional loads; in fact the steam consumption per 1000 cu. ft. of gas compressed will be nearly constant for the steam engine from full load to half load. This has been proven by actual tests which are available for reference.

In speaking of the test of the Nordberg compressor at the plant of the Carnegie Natural Gas Co., Underwood, West Va., Mr. McClelland incorrectly assumes that there is a superheater for the low pressure cylinder which is not the case. If such a superheater were employed the economy of the machine could be still further increased and an additional increase in economy could be obtained by installing economizers. In addition to this additional feed water heaters for absorbing the heat of compression of the gas could be installed so that the gas consumption of 14.6 cu. ft. of gas per I. H. P. in compressor cylinders can no doubt be deceased by at least 10%.

The writer is unable to check Mr. McClelland's figures of $43.00 per day saving in fuel of the gas plant, on page 71, but assuming that he has in mind a station having three 1350 H. P. units, with 50% load factor, and assuming, for the purpose of the argument, that the fuel consumption of the gas compressor is 9.55 and of the steam-driven compressor is 14.6, we have the following figures:

Fuel saving of gas plant per I. H. P. 5.05 cu. ft. Assuming gas to be worth 12c per 1000 cu. ft., the saving per day then becomes:

$5.05 \times 2025 \times 24{:}1000 \times 12 = \$29.40$ per day, or $10,720.00 per year, or $2.64 per H. P. per year, instead of the $3.90 shown by Mr. McClelland.

This $2.64 justifies an increased capitalization at 12% of $22.00 per H. P.

This $22.00 by no means represents the total cost of the gas plant per H. P. but it does quite accurately represent the extra cost of the gas plant per H. P. over the steam plant so that, following Mr. McClelland's reasoning, it will take ten years operation of the gas plant before it is as cheap as the steam plant. Having to assume a 10 year life in order to break even impresses the writer as poor financing, considering the uncertainty of the length of life of a gas field.

Mr. McClelland assumes that it will be well in making installments to have in mind the possible use in the future of coal as fuel. Following out this line of reasoning leads to some valuable conclusions in favor of the steam plant.

If we take the same plant as above assumed, that is three. 1350 H. P. units, operating at 50% load factor, and assuming gas to be worth 12c per 1000 cu. ft. and coal to be worth $1.50 per ton we have the following:

The gas plant at 9.55 cu. ft. of gas per H. P. 50% load factor will use: $2025 \times 9.55 \times 8760 = 176{,}000{,}000$ cu. ft. of gas per year. This at 12c per 100 cu. ft. is worth $20,400.00.

The steam consumption of the Nordberg engine, reported by Mr. Leland, is 11 lbs. of steam per I. H. P. hour, with coal at $1.50 per ton the cost of coal per year is:

$2025 \times 11 \times 8760{:}9 \times 2000 \times 1.50 = \$16{,}400.00$ assuming evaporation in the boilers of 9 lbs. of steam per pound of coal.

The net gain in operating a steam plant is, therefore, $4.000.00 per year, which, at 12%, will capitalize $33,500.00, this being the extra amount above the cost of the gas plant, which by the above reasoning, could be spent for the steam plant.

Furthermore, the cost of maintenance of boilers will be less than the cost of maintenance of producers and the cost of the boiler plant will be less than the cost of the producer plant with its necessary gas cleaning apparatus. It should also be remembered that if the compressors are operated on producer gas the cost of maintenance of the gas engines will be largely increased, and Mr. McClelland points out that with producer, gas troubles will be expected due to sticking of valves, etc.

With reference to that part of Mr. McClelland's paper in which he quotes Mr. Longacre with respect to volumetric efficiency, the writer begs to point out that one of the factors which influence volumetric efficiency has been omitted.

This factor is that of inlet heating. That is, in a compressor with long inlet passages and especially where the air or gas must be divided into thin streams, the temperature of the entering air or gas is increased by absorption of heat from the hot surfaces so that when compression starts, we have a volume of gas present at rock pressure but above rock temperature and the volumetric efficiency has been decreased in the ratio of the absolute temperatures of the rock and of the cylinder contents. For example: Suppose the rock temperature of the gas is 70° and that it is heated 20° in entering the cylinder, then the volumetric efficiency, due to inlet heating, is:

461+70:461+90=531:551 or 96.4%.

A. B. Macbeth: I would like to take one moment's time. I notice all the engine manufacturers recommend air receivers and high-pressure air for starting their engines. I have never yet been able to settle in my own mind why it was necessary. Any plant that is in good shape and has not got a lot of leaks around it, I cannot see why it is necessary to have high pressure air to start it. In the plant of the company I am associated with, we are not starting with high-pressure air and we do not see the use of it. Referring to the possibility of accident, I think it possible by the use of air, if gas should get into the air tank and explode it would wreck everything, whereas I think that more than offsets any other danger you might run into.

E. S. McClelland: I would like to say in reply to Mr. Leland, that I got this information from Mr. Johnston, superintendent of the Carnegie Natural Gas Company, and he led me to believe in the interview I had with him that the final test would not be available to be incorporated in the proceedings, but that the preliminary test was all that would be available. Therefore, I only made the reference that I did because I had no further information. I did not know the final test, while I knew it was being figured up, would be completed in time for this meeting.

E. D. Leland: I understand that, Mr. McClelland. The final test only arrived today.

E. S. McClelland: With regard to the statement made by Mr. Macbeth. I would like to ask, instead of using high-pressure air to start with, do you use high-pressure gas instead?

A. B. Macbeth: Yes.

E. S. McClelland: The gas enginemen do not always have a gas pumping plant at their command, and we are so in the habit of supplying high-pressure air for every condition requiring the use of pressure simply on that account, although it would work with a high-pressure pumping station just the same. We furnish the full equipment. We do not need that pressure if everything is tight. We can start with 50 or 60 pounds of air just as well as 200 if everything is tight. Often in a station of that kind when we want to get under way, we have to use air to help us do it.

James Posgate: My own experience with the repairs on steam boilers is such that they just about offset the extra expense in the way of repairs on gas engines, as Mr. McClelland states. The cleaning and replacement of tubes almost—possibly not quite—offsets the extra expense in keeping the gas engines in shape. There is one thing that suggests itself to me, and that is the greater possibility of efficiency of the steam engine to hold up as compared with the gas engine. The gas engine is such that if its efficiency begins to decrease, it is only a question of a day or two that you cannot run it at all; whereas, with a steam engine it simply imposes more work on the boilers, which will go on increasing and increasing to a point where it is noticed and brought very forcibly to the front. That is a condition I have often encountered. Of course, it should not be, but it is very often the case.

For the reasons that Mr. McClelland gives I think I favor the mechanical type of igniters. He speaks of the ignition causing the operator more trouble than any other feature. That should not be so today. For I think in a plant where everything is systematized properly there should be no longer any trouble with the ignition. If the igniters are put in and allowed to stay in until such a time that they fail the engine will have to shut down in order to replace them, of course, but under proper management this sort of condition should not arise.

In the opening paragraph of the paper, Mr. McClelland speaks of the industry changing from time to time. That is a detrimental feature possibly about this natural gas pumping, that the stations usually do not remain long as originally laid out and designed. One finds that that is quite a difficult condition to be associated with the highest efficiency. The stations are designed to do certain work, and conditions change, and then in the course of a few years they have to be added to or taken away from. That is a condition that makes this power proposition a little more difficult, I think, than a proposition where these changes are not so frequent, as, for example, with the use of an electric generator station. I thank Mr. McClelland for the paper which he has given us. It is certainly very instructive.

President Garard: Any other remarks?

A. B. Macbeth: I move that a vote of thanks be extended to Mr. McClelland for the very valuable contribution to our literature.

The above motion was then duly seconded and unanimously adopted.

President Garard: The next paper upon our program is "Petroleum and Natural Gas in West Virginia," by Prof. I. C. White. I now have the honor of introducing to you Professor I. C. White, State Geologist of the state of West Virginia, with whose work you are all familiar.

Prof. I. C. White: Mr. President and gentlemen of the Natural Gas Association, I could excuse all of you, I think, from staying in this torrid heat. It is almost as much as we get from the best West Virginia natural gas. I think it quite probable that I will leave out a large part of this address, because you have it before you in printed form and can read it at your leisure, under more favorable conditions. There are some things I hoped to add which would be of aid to you and I have had prepared, as you will see, some maps here showing conditions as they exist in certain parts of West Virginia that may be of interest. We have a geological survey in West Virginia. It has been going on for a number of years and we are just now getting to a position where we can aid the oil and gas interests as well. We are having structural maps prepared of every county in which we make studies showing the relation of the structure on these maps; the underground structure, and the different dips in the oil sands. We have also another map here showing similar conditions in Pleasant, Wood and Ritchie counties. We have also our state map showing the development of the oil and gas interests in the state and on this diagram I have attempted to show you the relation of our oil sands and gas sands to those of Pennsylvania and the geological scale. You will notice here is the Pittsburg coal at the top and going down the column you will find the different sands as they are encountered. In parenthesis are indicated the geological names of the rocks and sands. You know oil men are peculiar in giving names to oil sands. Usually the first time an oil producing sand is found, it is given a name and frequently from the name of the farmer. Of course, in our geological column we pursue another method. We name a rock or a sandstone—it is I think but a sand in oil parlance—we name it from the locality where its outcrop was first studied and described. For instance, the Connellsville sandstone was called by the oil men the "Minshall sand," and the "Morgantown" sandstone, which was first described by John J Stevenson, now retired professor of the University of New York, but which was first studied and described when he was professor of geology in West Virginia, is called by the oil men the "Murphy" sand. I do not know whether it was named after "Mike" Murphy or some other Murphy. Probably from some farmer on whose farm the oil was discovered.

Now, I do not know that it is necessary to take your time to read a paper which is printed and in your hands. Your president, whom I have known for so long a time that "the memory of man runneth not to the contrary," in-

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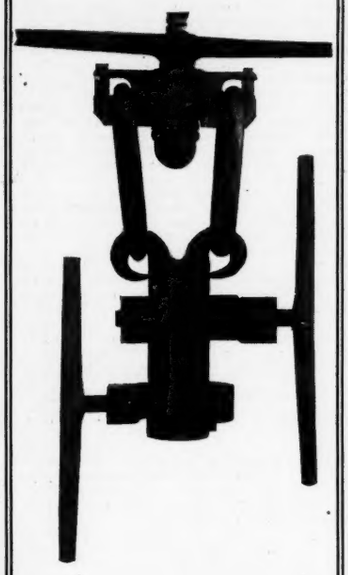

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sisted that I should present a paper at this meeting, and Mr. Jones, fortunately for you, insisted that it should be in writing so that it could be published. That, I think, will relieve me of the necessity of reading it. If there is anything you want to ask about it I would be glad to answer any questions or enter into any discussion with reference to it that is desirable to any member of the association.

I should say my work in oil and gas geology has been largely in the line of demonstrating a particular theory of the occurrence of oil and gas, not the origin of it, but of its accumulation. I was led to adopt and advocate that theory by Mr. William A. Earseman, who was then employed by the Forest Oil Company, and to whom I have always given the credit for the original suggestions. It is true after I had worked it out as a scientific theory, I found that others had written on this subject way back many years before. I have given credit to Dr. Hunt as having been the first to write upon this subject. I was well acquainted with him and he told me himself that he had published the first paper on the subject in the "Canadian Naturalist," a publication issued up in Canada in 1859, but it was about twenty-five years after the publication of his paper—he was an elderly gentleman at that time—and when I looked up the matter I found that the 1859 paper was on another subject entirely and that the paper referring to oil and gas and the scientific theory with reference to its accumulation was not published until August, 1861. I also ascertained that Dr. E. B. Andrews of Marietta College, a short distance above Parkersburg, in my own state, published a paper in the American Journal of Arts and Sciences of date May 20, 1861, so that, he really antedated Dr. Hunt's paper. It is but another illustration of the same thought occurring to minds entirely separated about the same time. You will remember we had some sort of a contest over the invention of the telephone and the telegraph and many other great inventions, the same thought having occurred to different people about the same time, and yet with no means of intercommunication. I had no knowledge of the thought or work of these gentlemen at the time I was first engaged on the subject, so that our discovery in the matter was made entirely de novo. I may say that these other gentlemen made no use of their discovery. They simply published what they had to say and let it drop at that. They attempted no practical application of it. That is where I claim a little credit for my work in the premises. I did all I could to bring it to the attention of the people interested in the production of oil. A very wealthy gentleman in my own state who was amply able to drill many oil wells, one of the men who was in at the foundation of the Standard Oil Company, and whose business was taken over by it, acknowledged to me that he thought the principles were correct, but he said he had gone out of the oil business and did not care to take it up anew. Another gentleman who has done a great deal in the oil business, I succeeded in convincing of the truth of this theory, and he was willing to back me with all the money he had, but unfortunately he did not have a great deal. He had lost most of it in the oil business, and while he believed in the theory and approved of the statements that I gave him with reference to it and was willing to back the theory with all the money he had, he did not have enough to demonstrate it, and it was, therefore, left largely to myself finally to go into the field and prove the theory which was evolved with reference to oil and gas occurrence. I opened the field at Washington, Pa. I made the location for the first gas well that was drilled in that field a short distance below Washington and the success of it afterwards led to the drilling of the famous "Gantz" well and the opening of that field for oil. After a number of wells were located and drilled in that locality, I located for J. M. Guffey the well at the south extension of the Murraysville field at Browns, which produced 35,000,000 feet daily, and was lit on the occasion of Mr. Cleveland's coming west. By several demonstrations of that kind, I had brought to the attention of the oil and gas fraternity the theories which I was advocating. but I could not get them to believe that there was much in the structural theory, so that finally I was compelled to go into the business myself, and down in West Virginia I leased up a large acreage of land and had a well drilled at Manington, which was really the opening of the West Virginia field, and which was some distance in advance of Mr. Hukill's development with which my friend Garard was connected. Mr. Kukill, like all oil men up to the time I undertook this study,

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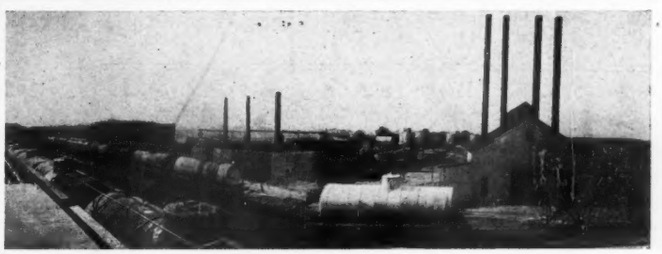

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believed in certain straight lines and believed that by going along these lines he could trace an oil belt for a long distance, and was content to follow the degree lines. I took up the subject, however, from the geological side and saw that a little south of Mt. Morris there were geological signs which, if my theory was correct, would lead to different results. I told Mr. Kukill that he was on the wrong track, that the oil belt turned west and near Manington or close to it in the direction I indicated and that is where I made the location. Mr. Hukill did not believe in my theory and he went on southward and got into gas territory, whereas the lines along which your speaker had taken the territory proved very productive and in fact one of the best oil fields of West Virginia. That is the reason why I got into the oil business and got out of the university. I had a great battle to estalish that theory. I was greatly aided in it by Dr. Orton, Sr., of Ohio. His analytical mind seemed to grasp at once the truth of the theory and he took up the subject with me. The expert geologists in the Pennsylvania survey, Messrs. Chance, Ashberner, and others had studied this question a great deal, and as the anticlines were not very well developed in the region around Titusville and their structural conditions were different, they could not see that I was on the right track. In fact, they opposed the theory. So that, with Dr. Orton's help, we were able to win the battle after a tedious and perplexing fight. I think now practically every oil and gas man of the country realizes the advantage of the study of structural conditions. In Illinois they have these structural lines, uplifts or arches. You do not need to have a complete arch. It is simply a dip in many instances, so that the oil and gas that are in the rocks will have an opportunity to move into a narrower belt and collect in commercial quantities, as Professor Orton has said, and he expressed it very well. He said if the rocks are horizontal and we drill through them, we "get a little of everything and not much of anything." In other words, we get a little oil, gas and water. But if the water can gravitate down to the bottom and the oil and gas separate by gravity, as I take it is the principal force, then we get commercial quantities of both oil and gas. Of course, if there is no water as we have in many places in West Virginia, for instance, here in Wetzel county, where there is one of the deepest holes you will find in the entire Appalachian field, the oil will be reached down at the bottom, because there is nothing to keep it up, and being liquid and heavier than gas it will go to the lowest point. So that, in every way the structural theory has aided the oil and gas man, and, as I say in this paper, the only unfortunate ones are those who have paid no attention to it. Had Mr. Hukill paid attention to my advice when he had that great oil field within his grasp here in West Virginia, he would have been a very rich man today, if he had kept strictly to the oil business, instead of having to sell under mortgage conditions that immense property that he once had. No one can afford to neglect the study of structural conditions in the production of oil and gas.

I have a statement in this paper of the character of the West Virginia oils and in connection with what Mr. McDowell told me yesterday about what he is doing in the manufacture of gasoline, this must prove very useful to any of you who are interested in oil and gas, because Mr. McDowell can, as he assures me, utilize even crude petroleum when it is light in gravity, 51 to 53 degrees, and as you see from this table many of our oils have that quality. I refer to the table which is found on page 91 of the printed papers, the data for which was mainly prepared for me by Mr. Scrafford of the Eureka Pipe Line Company. There is also some additional data on the following page prepared by one of my assistants. In this paper I call attention to a little correspondence that I had concerning the waste of gas. Mr. Clark in his letter I think did not fully understand—at least if he did he is begging the question—the place where the gas was coming from in Wetzel county especially. As I understood from Mr. Worthington, who was in immediate charge of the field, the most of it came from the "Stray" sand and any of you who were down through that field at the time the immense waste occurred in the nineties will realize that my statements on the subject were none too strong. In fact, they were not strong enough, because I am sure that for two or three years in Wetzel county alone more than half a billion cubic feet was going into the air every day. Most of it could have been shut in this "Stray" sand without affecting the production of the oil, except to increase the amount saved.

This waste of gas is one which I have tried to bring to the attention of the country. You will remember in my White House address in May, 1908, I brought it to the attention of the governors of all the states; and I am glad to see that the matter has been taken up by the members of this Association. It has been immensely gratifying to me in my talks with so many of you here who are so greatly interested, and in your public addresses where you have spoken of this matter, to know that you are all beginning to realize that we have been throwing away an immense heritage, and it is full time that we should begin to preserve it. I believe there was nearly as much gas deposited within the earth's crust in heating value as there was coal, I am sure of this so far as the regions of West Virginia are concerned, because in this region where no coal has been deposited, the gases that were placed there would more than have made up for the absence of coal, had they been preserved. But of course the oil men in their eagerness to get the oil from the biggest and the smallest well have practically dissipated the field. Of course, there is a great deal of gas here yet—low pressure gas—and a great deal of waste going on in that region; but with the field which is opening up for manufactured gasoline, it seems to be teaching the gas and oil men a lesson which they are going to heed; and I think that the conservation of this gas from the oil wells is going to prevent waste in the future, for that is where most of the waste has been, although in some individual cases millions of cubic feet have been permitted to flow into the air for years. Wells have been unplugged that could have been plugged; none of them had such a production as the famous Caddo well referred to in the Wrinkle Department. The gas in all of these wells could have been shut in and saved and used for commercial purposes; but our people did not realize its value at the time. However, with this manufactured gasoline from natural gas, it is teaching them all a lesson, and I think with the aid of this Association that the immense waste, which has affected my state more than any other, will be a thing of the past. I think my state has lost at least a quarter of a billion of dollars by the waste of natural gas, and probably more, almost one-fourth of the state's total assessed valuation.

Now, I do not want to detain you longer, as the paper is before you here. It is too hot to keep you longer, as I know you are all anxious to get away. If there are any questions that any of you would like to ask, I will cheerfully try to answer them. (Applause.)

Professor White's paper follows:

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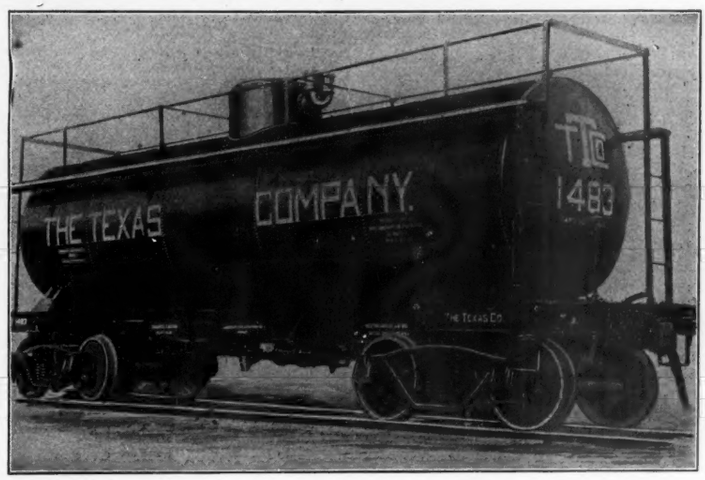

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PETROLEUM AND NATURAL GAS IN WEST VIRGINIA.

I. C. White.

The date of the first use of petroleum or its residual products, pitch and asphaltum, precedes authentic history. Probably the first recorded utiliation is that in the 11th chapter of Genesis in which it is stated that the soft or semi-fluid bitumen found in the valley of the Euphrates and translated "slime" was used as a mortar in the building of Babylon, more than 40 centuries ago. Eratosthenes, a celebrated Grecian writer who lived in the 3rd century B. C., has described this bitumen from the Springs of Hit on the Euphrates, and has also told of its use in the construction of mosaics, pavements, etc., in the beautiful palaces and temples of ancient Nineveh and Babylon.

Herodotus, the father of history, who lived in the 5th century B. C., or nearly 24 hundred years ago, has told us in his inimitable style how asphaltic oil was procured in his day from a lake on the island of Zante in the Mediterranean off the coast of Greece by swabbing it up with a branch of myrtle, very much like the early settlers of the Allegheny and Little Kanawha valleys of Pennsylvania and West Virginia collected petroleum from the surface of water with woolen cloths, so that in the primitive methods of procuring mineral oil there is apparently "nothing new under the sun." Aristotle, who lived in the 4th century B. C., describes the deposits of bitumen in Albania along the eastern shores of the Adriatic sea, while Pliny and Dioscorides, who lived in the first century of the Christian era, have given an account of the oil springs of the island of Sicily, and the use of petroleum in lamps under the name of "Sicilian oil." Many ancient writers and travelers like Plutarch, Strabo, Marco Polo, and others have recorded the use of "rock oil" and pitch in Arabia, Persia, India and elsewhere from the earliest historic periods.

One of the nearly extinct religious cults, that of the Fire Worshipers, or Parsees, was founded upon the mystery which the priesthood of that religion threw around the perpetual fire maintained on the altars of their temples with natural gas. When your speaker visited Baku on the shore of the Caspian sea in 1897, he saw the ruins of one of these mystic shrines the last of whose priests had disappeared only 20 odd years before. In dismantling the altar of this ancient structure, it was discovered that it had been built over a fissure in the earth from which natural gas issues, and that a secret pipe conducted the gas from the fissure to the altar, where its lambent flames had inspired the Fire Worshipers with a belief in the supernatural powers of the priests of Zoroaster. It is possible that similar tricks of deception have imposed upon the credulity of mankind during the childhood of the race in the establishment of other primitive religious beliefs. In China, that great empire whose civilization has remained practically unchanged for so many centuries, crude methods of using natural gas were practiced more than two thousand years ago, while the Japanese have also collected and utilized mineral oil for many hundreds of years.

Hence we find that the oil and gas seepings welling up through fissures in the earth's stratified crust were both observed and used by primitive peoples of most every country. The earliest written account of the occurrence of petroleum in America is apparently that of a Jesuit missionary who came from Canada into New York in 1629, and wrote a letter concerning it which was published in Sagard's "History of Canada" in 1632.

The petroleum seepings on Oil creek in Pennsylvania and on Hughes and Little Kanawha rivers in what is now West Virginia were doubtless known and used by the Indians long before white men visited the regions or Columbus landed in America. The earliest published account of the oil springs near Titusville, Pennsylvania, appears to be that of a Swedish traveler, one Peter Kalm, about 1750, while those of Wirt and Ritchie counties of West Virginia as well as of similar seepings on the Big and Little Muskingum rivers of Ohio, were first described by Dr. S. P. Hildreth of Marietta, Ohio, in an article published in "The American Journal of Science and Arts," New Haven, Connecticut, for February, 1826. In speaking of the flows of petroleum from the salt wells of the Little Muskingum which interfered seriously with salt production, he says: "Petroleum affords considerable profit, and is beginning to be in demand for lamps, in workshops and manufactories. It affords a clear, brisk light when burnt this way, and will be a valuable article for lighting the street lamps in the future cities of Ohio." Pennsylvania is generally given the credit for originating the petroleum industry because it was on the Watson flats near Titusville that the first well was purposely drilled for petroleum and completed August 28th, 1859, by Col. Drake, but in Volume I of the West Virginia Geological Survey, your speaker has shown in extracts from the books of Bosworth, Wells & Co. of Parkersburg and Marietta, that a large commercial business in the purchase and sale of petroleum by this firm had been carried on as early as the '40's. Also, that casing, jars, and drilling tools generally had all been invented by citizens of West Virginia a half century before Col. Drake completed the historic well on the banks of Oil creek, and hence the credit for originating the great petroleum industry should at least be shared by Pennsylvania with her adjoining sister.

In discovering and utilizing natural gas, West Virginia clearly has precedence over Pennsylvania, for probably the first recorded reference to this valuable fluid in the United States was made as early as 1775 by Gen. Washington, who pre-empted the land around the "burning spring," 9 miles above Charleston, in the Great Kanawha valley, which he described as "A bituminous spring of so inflammable a nature as to burst forth" (take fire) "as freely as spirits and is nearly as difficult to extinguish." It is also well known that the first use of natural gas for manufacturing purposes in America was by Mr. William Tompkins in the same Kanawha valley, who in 1841 struck a large flow of gas in boring a salt well only a few hundred feet distant from the "burning spring" that Washington had noted 66 years before, and piping the gas to his salt works used it instead of coal in boiling down the brines, displacing several hundred bushels of coal daily.

Modesty forbids any extended comment on the part which West Virginia has taken in developing and making known to the oil and gas world a scientific method of locating oil and gas territory, for although the anticlinal theory had been discovered and announced by Hunt, Andrews, Hoefer and others a quarter of a century before, your speaker, in connection with Mr. Earseman of the Forest Oil Company, rediscovered its truths, it remained in the "dead letter" office of untested theories until it was taken up and vitalized for all time through the efforts of a West Virginian in its successful application to the discovery of new gas and oil pools. Indeed, to such a low estate had the efforts of scientific men to aid the drill in finding petroleum and natural gas fallen previous to the reannouncement of the "anticlinal theory" in the issue of "Science" for June 26th, 1885, and the successful demonstration of its great value as an aid to the oil and gas industries, that one prominent operator, disgusted at frequent failures of geologists to locate productive oil pools for him, was led to remark that if he desired to be absolutely sure of getting a dry hole he would hire a geologist to make his location. Now, however, the only unfortunate ones are those operators who neglect to study rock structure or the dip and strike of the stratified measures as taught by the anticlinal theory.

In the year 1893, just after the oil and gas fields of West Virginia had been developed in the northern end of the state, your speaker made the prediction in a talk before the members of the West Virginia legislature, that the petroleum and natural gas fields of the state would extend entirely across it from Hancock county on the north to the Kentucky line on the southwest. The West Virginia Coal, Oil and Gas Map, exhibited here, as well as the State Survey's detailed county maps, shows how closely that prediction has been fulfilled, and also how the structural theory of oil and gas had been verified by every pool of either gas or oil found along this great petroliferous belt.

In passing southwestward from Pennsylvania into and across West Virginia practically all of the oil and gas sands of Allegheny, Washington and Greene counties have been found and identified in northern West Virginia down to and including the Sixth or Bayard Sand of Greene county, which so far remains the lowest productive horizon for oil and gas within the boundaries of our state, although a slight showing of oil has been noted in the Boggs Run deep (4500') well at 2631 feet below the Pittsburg coal, and in one (J. F. Bobbs) 3 miles south of Glen Easton, Marshall county, at 2659 feet below the Pittsburg coal, or 673 feet below the top of the Gordon Sand, and which Mr. Hennen, my assistant, thinks would correlate with the Speechley horizon of Pennsylvania. But as we pass to the southwest all of the sands below the Big Injun horizon appear to fade out into shales and fine sandy beds too close of grain to hold commercial quantities of either oil or gas after we pass to the south of the Little Kanawha river, excepting the Berea Grit which remains productive on into Kentucky.

The latest, detailed studies of the West Virginia Geological Survey, carried on from the Pennsylvania line southwestward to and including Roane county, principally by one of my assistants on the Survey, Mr. Ray V. Hennen, has resulted in some revision of the column of geological horizons at which oil and gas have been developed within the state. Mr. Hennen finds that much confusion has arisen in connection with the identification by oil well drillers, as also by engineers and geologists, of the First and Second Cow Run Sands, as originally named from their type localities on Cow Run, Washington county, Ohio. He identifies the "First Cow Run Sand" of the type locality with the Buffalo sandstone of the Conemaugh series, and he identifies the Second Cow Run Sand which comes 400 feet lower with the Homewood standstone, or uppermost member of the Pottsville series. Accepting this revision as correct, the table of oil sand formations with their geologic equivalents as grouped by Mr. Hennen, reads as follows:

The Oil and Gas Horizons of West Virginia.

Carboniferous:

Monongahela Series: Carroll sand (Uniontown).

Conemaugh Series: Minshall (Connellsville); Murphy (Morgantown); Moundsville (Saltsburg); First Cow Run (Little Dunkard) sand (Buffalo); Big Dunkard sand (Mahoning).

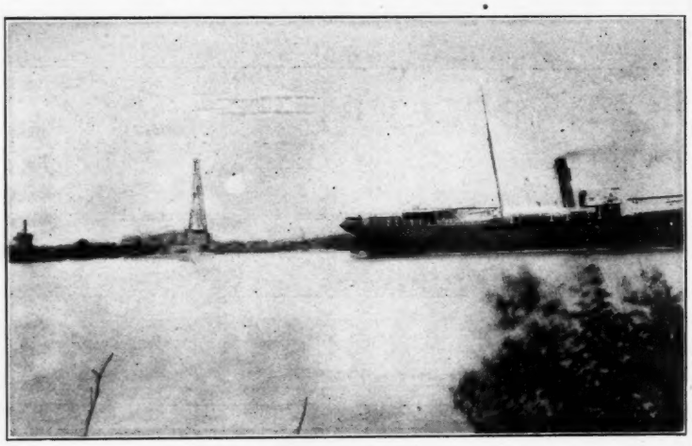
Allegheny Series: Burning Springs (Upper Freeport) sand; Gas sand (Lower Freeport).

Pottsville Series: Gas sand of Marion and Monongalia counties (Homewood), Second Cow Run of Ohio; gas sand of Cairo; salt sand of Cairo; Cairo.

Mauch Chunk Red Shale: Maxton, Dawson, Cairo.

Greenbrier Limestone: "Big Lime," not generally productive.

Pocono Sandstones: Keener sand and Beckett sand of Milton; Big Injun sand; Squaw Sand; Berea Grit.



SCENE ON PANUCO RIVER.

The Caracol, near the town of Tamos, 14 miles west of Tampico on the Panuco river. A river packet, with the well of the Tampico Fruit Company in the background.

Devonian.

Catskill Red Beds: Gantz sand, Fifty-foot sand, Thirty-foot sand, Stray sand, Gordon sand, Fourth sand, McDonald or Fifth sand, Bayard or Sixth sand.

Chemung and Portage Beds: Warren First, or Second, Tiona, Speechley sand. No well defined oil or gas horizons yet discovered in West Virginia.

The following table gives the approximate intervals of the several oil and gas sands below the Pittsburg coal in the northern end of the state, though, of course, these intervals may vary many hundred feet in different portions of the same; for instance, the interval from the Pittsburg coal to the Berea Grit, near Chester, Hancock county, is only about 1500 feet, but this increases to 1650 feet at Wellsburg, 1700 at Wheeling, 2050 at Huntington, and 2800 feet at Griffithsville, Lincoln county, through the thickening of intervening formations; hence the figures given in the table must be understood as applying only to the northern central region of the oil and gas belt of the state.

Approximate Distance From Pittsburg Coal to Top of Oil and Gas Sands.

Sand.	Distance, Feet.
Minshall (Connellsville) sand	110
Murphy (Morgantown) sand	200
First Cow Run (Little Dunkard) (Buffalo) sand	420
Big Dunkard (Mahoning) sand	500
Burning Springs (Upper Freeport) sand	590
Gas (Lower Freeport) sand	720
Second Cow Run (Homewood) sand	800
Salt sand	900
Maxton sand	1125
Big Lime	1300
Keener sand	1375
Big Injun sand	1400
Berea Grit sand	1800
Gantz—Fifty-foot sand	2000
"Gordon-Stray" sand (Nineveh)	2050
Gordon sand	2100
Fourth sand	2200
Fifth sand (McDonald)	2300
Sixth, or Bayard sand	2400
Speechley sand	2650
Corniferous Limestone	3500
Clinton sand	5000

The Corniferous Limestone, or top of the lower "Big Lime" of the Ohio Geological Survey, has been certainly penetrated at only one locality in West Virginia; viz., in the Central City deep boring at Huntington, Cabell county, where it was encountered at 1005 feet below the Berea Grit, or at a depth of 2700 feet below the Ohio river, and 3100 feet below the Pittsburg coal. This important horizon is evidently nearer the surface in the Huntington-Kenova region than anywhere else along the Ohio valley, since a boring (No. 16 Mount farm) in Wood county, penetrated the measures to a depth of 1924 feet below the Berea Grit without reaching the Corniferous horizon, and in the Boggs Run deep well, near Wheeling, the drill did not reach the Corniferous at a depth of 2500 feet below the same stratum, and 4200 feet below the Pittsburg coal, while in the deepest (5575 feet) well in the United States, drilled on the Wm. Bedell farm near West Elizabeth, Allegheny county, Pennsylvania, the drill was still in Devonian shales, and probably 100 to 200 feet above the Corniferous, at a depth of 5700 feet below the Pittsburg coal, and 4000 feet below the Berea Grit horizon, though in the Conway deep well on the Allegheny river, near Franklin, Pa., the top of the Corniferous was reported at about 3700 feet below the Berea. Hence it will be observed that there is a rapid thickening of the Devonian or Ohio shales southeastward from the oil and gas regions of central Ohio.

The discovery of the Clinton sand of Ohio as prolific in either oil or gas almost from the Ohio river to Lake Erie, naturally suggests the query as to whether or not this or the Trenton oil horizon, a thousand feet lower, may ever be found productive in West Virginia. In the opinion of your speaker, it is simply a question of deep drilling at points favorably situated structurally along the Ohio river valley, and its tributaries to the southeast. A favorable region for making such a test would be in Hancock county, because anywhere between New Cumberland and the northern line of Hancock, near Chester, the Clinton sand should be found at a depth not exceeding 4500 feet below the bed of the Ohio river, since the Berea Grit is only 600 to 700 feet below the valley and at Zanesville, 80 miles southwest from Chester, the interval between the Berea Grit and the Clinton sand was only 2676 feet, and the thickening of the measures northeastward could hardly exceed 15 feet to the mile, or say 1200 feet between Zanesville and Chester, which would give approximately the following to the Clinton in the region of Chester, viz.: 600'+2676'+1200'=4476', a depth very readily attainable by modern drilling methods.

Another favorable region for testing out the Clinton sand in West Virginia would be along the Burning Springs Anticlinal in Wood county, 60 miles southeast from Zanesville, where the depth to the Clinton horizon should not much exceed that (4500 feet) near Chester, Hancock county, since the Berea Grit is only about 1000 feet below the surface along the main portion of the Burning Springs arch between the Little Kanawha river in Wirt county and the Ohio river in Pleasants, where this great fold enters the state of Ohio, near Belmont, five miles below St. Marys. In fact, it is possible that the horizon of the Clinton sand could be reached by the drill anywhere between the Little and Big Kanawhas north from the Elk river in West Virginia, at depths of less than 5000 feet, since the westward thinning of the Devonian shales brings the top of the Corniferous Limestone (only 600'—1000' above the Clinton sand) to only 2700 feet below the bed of the Ohio river at Huntington, Cabell county, so that this deep oil horizon of Ohio could be penetrated by the drill anywhere along the Ohio river west of Point Pleasant at the mouth of the Great Kanawha at depths not exceeding 4,000 feet. Just how far up the Kanawha, Guyandotte, and Big Sandy rivers southward from the Ohio river it will be possible to bore to the Clinton Sand is a matter of conjecture only since the Devonian shales evidently increase in thickness southward. This is demonstrated by the experience of the Big Creek Development Company in drilling down one of its recent wells (No. 5 Emma Griffith) near Yawkey in the Griffithsville field of Lincoln county to a depth of 4,002 feet, the drill after passing a thin (2') sand with a showing of oil at 65 feet below the Berea Grit, finding nothing but soft, muddy shales to 1,800 feet below the latter horizon, the interval between the Berea and the Corniferous Limestone having increased from 1,005 feet to 1,800 feet + an undetermined additional amount, in the 30 miles between Huntington and the Griffithsville region, the direction being nearly south 45° east. It is quite probable that the top of the Corniferous Limestone would have been encountered within the next 200 feet in the Yawkey well. This would give the rate of southeastward thickening of the Devonian Shales about 30 to 35 feet to the mile.

But while it is possible to drill to the Clinton sand horizon as far south as Naugatuck or Williamson in Mingo county along the Big Sandy river drainage, or Kanawha Falls on the Great Kanawha, it must not be understood that there is any absolute certainty of finding productive oil or gas

horizons therein. If your speaker were asked for advice in the matter as to the best locations for these deep sand tests (since other productive horizons beside the Clinton may be developed between it and the Berea Grit), he would recommend first the crest of the Burning Springs anticlinal somewhere between Burning Springs and the Ohio river, as shown upon the structural map of Pleasants, Wood, and Ritchie counties, and after that the region of Marmet, 9 miles south of Charleston, or Chapmansville on the Guyandotte, 6 miles below Logan, or Kermit on Tug river, or near Madison on Coal river, since all of these localities are near the crests of structural disturbances or arches in the earth's crust.

Quantity and Quality of West Virginia Petroleum and Natural Gas.

The quality of the West Virginia petroleum is so well known that it is unnecessary to add anything at length on this subject. Suffice it to say, that it is all of the highest grade with paraffine base, averaging about 45° gravity Baume, and ranging from the heavy lubricating oils of the Volcano shallow sand district to that of the Moundsville region of 63½° Baume, practically the lightest oil ever discovered.

The production of the state exceeds that of Pennsylvania, and for the year 1909 was 10,745,092 barrels, valued at $17,642,283. The statistics for 1910 are not yet available, but the quantity was greater than for the year 1909. The tables of West Virginia oils taken from Volume I (A) W. Va. Geological Survey, on Petroleum and Natural Gas, as prepared by Mr. H. L. Scrafford, general superintendent of the Eureka Pipe Lines (appearing in adjoining columns on this page), will give a good idea of their quality.

How Long Will West Virginia's Gas Supply Endure?

The question of the duration of the natural gas supply of West Virginia is one that very much interests most of her surrounding neighbors, Pennsylvania, Ohio, Kentucky, and Maryland. Had the oil and gas operators within her borders conducted the business with even ordinary foresight from the beginning, instead of causing, and permitting such enormous wastes of this precious fuel, there is no doubt that many years of supply could have been added to the gas resources of West Virginia, vast as they still are, after many hundreds of billions of cubic feet amounting to a quarter of a billion of dollars in values or more have been ruthlessly permitted to escape into the air. This preventable waste is still very large, especially from producing oil wells, and remains a standing reflection upon the business management and intelligence of the oil and gas operators who still permit this most valuable product loaded in most cases with much easily recoverable gasoline, to escape into the air unused even for the manufacture of carbon black. Anyone who has visited the Oklahoma oil fields within recent years can see a picture of the billions of cubic feet of wasted hydrocarbons that once daily escaped into the air from the great oil and gas pools of West Virginia during the period of their development within the last 20 odd years. Your speaker has done all that was possible for any one to do in calling public attention to this waste of the State's most valuable resource, but all to no purpose.

Soon after assuming the office of State Geologist to which I was appointed while on a visit to the Russian oil fields late in 1897, I took up the question of natural gas waste from oil wells which had during the years 1897-8 attained enormous proportions, especially in the counties of Marshall, Wetzel, Tyler and Doddridge, where probably more than a billion cubic feet daily was rushing into the air mostly from the Gordon Stray sand under a rock pressure of 1,100 pounds, and carrying with it large quantities of oil from the Gordon sand 40 to 50 feet lower. My first effort was to try to induce the larger oil operators to preserve this gas for future use, simply by putting in an extra string of casing set in the slate of 10 to 30 feet in thickness which separates the gas rock (stray sand) above from the oil sand (Gordon) below, an admirable condition for complete separation of the two products, and the shutting in of the gas until needed. Realizing that example is contagious, and that if the cooperation of the great oil producing corporations could be enlisted in the conservation of natural gas, the smaller operators would readily fall into line with the same policy, your speaker concluded to take up the matter first with the South Penn Oil Company, whose active managers at the time were N. F. Clark, vice president of the company, with headquarters in Pittsburg, and John Worthington, field manager, with headquarters in Mannington. The following unpublished correspondence with Mr. Clark on this subject is here given as a contribution to the history of natural gas waste in our State, since it is of sufficient public interest to warrant preservation as exhibiting the attitude of the Standard Oil Company toward the question at that time. I should say for Mr. Worthington that he fully recognized the immensity of the waste, and that he told me there was no difficulty whatever in shutting in this stray sand gas without interfering in any way with the prosecution of Gordon oil except to increase it by stopping the waste carried off with the enormous flow of Stray Sand gas, some wells producing as much as 12 to 15 million feet daily from which only 5 to 10 barrels of oil could be saved. Mr. Worthington said it was simply a question of the cost ($1,000 to $1,500) of an additional string of casing, and that his company had refused to undergo that additional expense, since the officers were anxious to make a good

Location of Pump Station.	County.	Sand.	Gravity. Degrees B.	Color.
Mt. Morris	Green, Pa.	Big Injun	46	Amber
Mt. Morris	Green, Pa.	Dunkard	42	Amber
Mt. Morris	Green, Pa.	Elizabeth, Sixth	41	Amber
Dolls Run	Monongalia	Big Injun	46	Amber
Jakes Run	Monongalia	Big Injun	46	Amber
Basnett, Fairview	Marion	Gordon	43½	Amber
Basnett, Fairview	Marion	Big Injun	45¾	Amber
Downs, Mannington	Marion	Gordon	42¾ to 43½	Amber
Downs, Mannington	Marion	Big Injun	46½	Amber
Tetrich	Marion	Gordon	42½	Amber
Joetown	Marion	Gordon	42¾	Amber
Masters, Board Tree	Green, Pa.	Gordon	42½	Amber
Glendale	Marshall	First Cow Run	63½	Amber
Arches	Wetzel	Dunkard	52½	Amber
Arches	Wetzel	Big Injun	45¾	Amber
Arches	Wetzel	Big Injun	46½	Amber
Arches	Wetzel	Big Injun	48¼	Amber
Arches	Wetzel	Gordon	39¼	Amber
Arches	Wetzel	Gordon	42¾	Amber
Richwood	Wetzel	Gordon	43¾	Amber
Pine Fork	Wetzel	Gordon	44¼	Amber
Braden, Indian Creek	Tyler	Big Injun	47½	Amber
Braden, Indian Creek	Tyler	Gordon	44¼	Amber
Big Flint	Doddridge	Dunkard	48¼	Black
Big Flint	Doddridge	Maxton	45	Amber
Big Flint	Doddridge	Big Injun	42¼	Black
Big Flint	Doddridge	Big Injun	43¾	Black
Big Flint	Doddridge	Big Injun	45½	Amber
Big Flint	Doddridge	Big Injun	46½	Amber
Big Flint	Doddridge	Big Injun	47½	Amber
Big Flint	Doddridge	Gordon	42	Amber
Big Flint	Doddridge	Gordon	43¾	Amber
Big Flint	Doddridge	Gordon	48¾	Amber
Big Flint	Harrison	Fifth, McDonald	44	Amber
Ankrom, Indian Creek	Tyler	Maxton	45½	Amber
Ankrom, Indian Creek	Tyler	Big Injun	48	Amber
Ankrom, Indian Creek	Tyler	Big Injun	46½	Black
Martin, Elk Fork	Tyler	Keener	49¾	Amber
Sancho (Bradens)	Tyler	Maxton	43	Black
Sancho (Bradens)	Tyler	Big Injun	50	Amber
Wick	Tyler	Cow Run	47	Green
Wick	Tyler	Maxton	47	Black
Wick	Tyler	Keener	45	Amber
Wick	Tyler	Big Injun	52	Amber
Hebron	Tyler	Cow Run	46	Green
Hebron	Tyler	Big Injun	44	Amber
Stewart, Middle Island Creek	Tyler	Cow Run	64	Amber
Stewart, Middle Island Creek	Tyler	Maxton	44	Black
Stewart, Middle Island Creek	Tyler	Keener	53¾	Amber
Stewart, Middle Island Creek	Tyler	Big Injun	44½	Amber
Stewart, Middle Island Creek	Tyler	Big Injun	46¾	Green
Thistle, Sisterville	Tyler	Keener	54	Black
Thistle, Sisterville	Tyler	Keener	48	Amber
Thistle, Sisterville	Monroe, Ohio	Keener	47	Amber
Thistle, Sisterville	Monroe, Ohio	Salt Sand	47¾	Amber
Thistle, Sisterville	Monroe, Ohio	Big Injun	44	Amber
Thistle, Sisterville	Monroe, Ohio	Big Injun	47½	Amber
Thistle, Sisterville	Monroe, Ohio	Big Injun	50	Amber
Thistle, Sisterville	Monroe, Ohio	Maxton	50½	Amber
Thistle, Sisterville	Monroe, Ohio	Berea	47	Black
Trail Run	Washington, Ohio	Keener	46½	Amber
Trail Run	Washington, Ohio	Keener	44½	Amber
Trail Run	Washington, Ohio	Keener	46	Amber
Trail Run	Washington, Ohio	Big Injun	46¾	Amber
Trail Run	Washington, Ohio	Big Injun	47	Amber
Trail Run	Washington, Ohio	Big Injun	48	Amber
Cairo	Ritchie	Salt Sand	49	Amber
Cairo	Ritchie	Big Injun	45½	Amber
Pennsboro	Ritchie	Boulder	50	Amber
Burning Springs	Wirt	Cow Run	41	Amber
Burning Springs	Wirt	Big Injun	39	Green
Volcano	Wood	Salt Sand	51	Green
Volcano	Wood	Berea	34½	Green
Mounts, Stillwell Creek	Wood	Berea	50½	Green
Boreman, Worthington Creek	Wood	Berea	41	Green
Big Run	Wood	Cow Run	39½	Green
Bull Creek, Waverly	Wood	Cow Run	43	Green
Bull Creek, Waverly	Wood	Big Injun	46	Green
Eureka	Pleasants	Cow Run	40	Green
Eureka	Pleasants	Berea	46	Green
Eureka	Washington, Ohio	Shallow	51	Green
Eureka	Washington, Ohio	First Cow Run	42	Green
Eureka	Washington, Ohio	First Cow Run	49	Green
Eureka	Washington, Ohio	Second Cow Run	50½	Lt. green
Eureka	Washington, Ohio	Salt Sand	43½	Dark green
Eureka	Washington, Ohio	Big Injun	42	Dark green
Eureka	Washington, Ohio	Big Injun	42	Green
Eureka	Washington, Ohio	Berea	63½	Amber
Eureka	Washington, Ohio	Berea	41	Green
Eureka	Washington, Ohio	Berea	47½	Amber
Corning	Athens, Ohio	Berea	38	Black
New Castle	Monroe, Ohio	Berea	43	Black
Barnesville	Belmont, Ohio	Berea	44	Black

Mr. Ray V. Hennen, Assistant Geologist of the Survey, has visited several of the producing regions of the state and made a few tests of the gravity of the oils as they come fresh from the wells as also that of some bottled samples. His results are embodied in the following table:

Location of Sample Near	County.	Sand.	Gravity Degrees B.	Farm and Well Number.	Remarks.
Milton Field	Cabell	Keener	40.6	C. E. Burns, No. 2	Fresh oil.
Milton Field	Cabell	Keener	40.6	C. Beckett, No. 1	Fresh oil.
Milton Field	Cabell	Keener	40.9	J. Harshbarger, No. 1	Fresh oil.
Milton Field	Cabell	Keener	33.1	E. W. Beckett, No. 1	1st in field, standing 1 mo.
Milton Field	Cabell	Keener	34.9	E. W. Beckett, No. 1	Bottled sample.
Milton Field	Cabell	Cow Run	42.4	E. W. Beckett, No. 1	Bottled sample.
Milton Field	Cabell	Keener	40.7	E. W. Beckett, No. 2	Fresh oil.
Milton Field	Cabell	Cow Run	46.2	E. W. Beckett, No. 3	Saved by drillers.
Milton Field	Cabell	Keener	41.1	T. J. Berkley, No. 1	Fresh oil.
Yellow Creek	Calhoun	Gantz (?)	42.0	J. Metz, Nos. 2 and 4	Old wells.
Yellow Creek	Calhoun	Gantz (?)	41.2	J. Metz, Nos. 1 and 3	Old wells.
Yellow Creek	Calhoun	Gantz (?)	43.0	J. Metz, No. 4	Old wells.
Yellow Creek	Calhoun	Gantz (?)	44.3	J. Metz, Nos. 6, 7 and 8	Old wells.
Yellow Creek	Calhoun	Gantz (?)	48.3	S. Selman, No. 1	New, largest in field when struck.
Yellow Creek	Calhoun	Gantz (?)	45.5	Oaf Taylor, No. 2	
Rowles Run	Calhoun	Gantz (?)	44.1	R. Curry, No. 1	1st in field.
Rowles Run	Calhoun	Gantz (?)	44.6	E. A. Fore, No. 2	20-bbl. well.
Chester	Hancock	Berea	49.3	S. A. Richmond, No. 2	Fresh oil.
Chester	Hancock	Berea	48.0	S. A. Richmond, No. 1	Fresh oil.
Chester	Hancock	Berea	47.7	S. A. Richmond, Nos. 4, 5	Fresh oil.
Chester	Beaver, Pa.	Berea	46.0	T. M. Nicele, No. 1	W. Pa.-Pa. line.
Moundsville	Marshall	Dunkard	47.5	Higgins, Nos. 1, 2 and 3	In tank s'time.
Amos P. O.	Marion	Fifth	43.8	S. J. Harvey, No. 4	Deepest oil well in world (3,631 ft.).
Amos P. O.	Marion	Bayard	42.1	Wilson Hrs., No. 9	Fresh oil.
Cairo	Ritchie	Keener	45.0	J. Moats, No. 5	Fresh oil.
Cairo	Ritchie	Keener	45.9	S. Moats, No. 4	Fresh oil.
Cairo	Ritchie	Salt	43.1	R. Moats, No. 2	1st in field (14 yr.).
Cairo	Ritchie	Big Injun	45.8	A. M. Douglas, No. 1	Fresh oil.
Cairo	Ritchie	Big Injun	43.6	D. M. Sleeth, No. 1	Bottled sample.
Cairo	Ritchie	Carroll	46.0	A. Y. Pew, No. 2	Bottled sample.
Cairo	Ritchie	Carroll	40.9	J. C. Lee, No. 10	Bottled sample.
Smithville	Ritchie	Big Injun	44.1	Wm. Barker, No. 2	90-bbl. well.
Burton	Wetzel	Maxton	43.5	W. G. Snodgrass, No. 1	Bottled sample.
Burton	Wetzel	Maxton	44.0	J. Santee, No. 2	
Burning Springs	Wirt	2nd Cow Run	39.1	Roberts Bros.	
Burning Springs	Wirt	Salt	38.0	Roberts Bros.	
Burning Springs	Wirt	Salt	37.0	A. P. Clark, Nos. 1-6	
Burning Springs	Wirt	2nd Cow Run	42.8	Roberts Bros.	
Burning Springs	Wirt	500 feet	33.3	Roberts Bros.	
Burning Springs	Wirt	Keener	41.8	Roberts Bros.	

financial showing. The State Geologist's letter to Mr. Clark is given herewith:

Morgantown, W. Va., Nov. 11, 1898.

Mr. N. F. Clark, Vice President South Penn. Oil Co., Pittsburg, Pa.

My Dear Sir:—Last week I was across Wetzel, and made a circuit through Tyler and Eastern Doddridge counties in order to get a general view of the oil and gas development.

I was very much surprised and disappointed at the great waste of gas that is going on in the Piney Fork field of Wetzel county. It seems to me that there must be some remedy or method of shutting in and storing this gas which contains within itself so much of value that the future will need. No one is better prepared than yourself to understand and appreciate the vast amount of this waste and how greatly the future of only a few years will regret its loss. I, of course, have no means of making any accurate estimate of the volume of this precious fuel which is daily passing into the air and doing no useful work except to bring with it a few barrels of oil from all the numerous wells from which it escapes, but the total amount must certainly run into the hundreds of millions of cubic feet. If we put the amount at only one hundred million cubic feet, which is certainly far within the limits of fact, and reduce the same to its equivalent value in coal for heat or fuel purposes according to the well recognized ratio of one thousand cubic feet of gas for the heat equivalent of one bushel of coal daily being utterly wasted in the Wetzel county region, and as natural gas is simply the more volatile constituents of petroleum, the same reasoning gives a loss in equivalent of either light or heat as measured in petroleum of 20,000 to 25,000 barrels of oil daily. And when we remember that the estimate of one hundred million cubic feet of gas is far within the limit of waste, the figures become simply appalling, so much so, that I feel it my duty as a representative of the economic interests of the State to call your attention to this great waste of the State's resources, in order that, if possible, you may find a speedy remedy for the matter referred to.

I am aware that there has already been some legislation on the subject by our law-making power, but in this as in other matters, laws are generally dead letters unless we can secure the active and intelligent co-operation of the people most interested in preserving these precious reservoirs of stored power.

I need not remind one so well informed as yourself concerning these matters that the quantity of hydro-carbon compounds representing our stores of petroleum and natural gas is a definite and limited amount, and is undergoing rapid exhaustion. The nearly exhausted natural gas fields of many regions of Indiana, Ohio, and Pennsylvania all repeat the same story of first, criminal waste, and second, a limited and failing quantity of the original supply.

West Virginia is entering upon the same path of ruthless and criminal waste of its precious natural gas supply, and we will soon have the same history as the other regions unless the enormous waste which is now going on can be speedily checked. I appeal to you as representing one of the great gas and oil producing companies of the State to take the initiative in this matter of shutting in and preserving for future use in this and other States, the vast amount of natural gas which is now going to waste, especially in Wetzel county. Of course, there may be mechanical difficulties connected with the effectual prevention of this waste that will be hard to overcome, but I am sure that a company so fertile in resources, mechanical devices, and inventions as your own, will find no serious trouble in solving the problem of shutting in and preserving this gas. Please take up the matter at your earliest convenience with your people and see if you can work out a solution of the problem.

Yours very truly,
(Signed) I. C. WHITE,
State Geologist.

To this appeal Mr. Clark replied as follows, giving the South Penn Oil Company's side of the question:

SOUTH PENN OIL COMPANY,

Pittsburg, Pa., Nov. 16, 1898.

Prof. I. C. White, Morgantown, W. Va.

My Dear Dr. White:—I am duly in receipt of your esteemed favor of the 11th inst. I note with much interest your remarks as to the waste of gas in the Piney Fork field, Wetzel county. We have given the subject a great deal of thought from time to time in reference to what method could be devised to utilize and save the escaping gas from some of the wells in that section, but thus far have been unable to apply anything practicable to this end. You are no doubt aware that a number of the wells drilled in that locality found the gas supply, which is very considerable, on top of the stray sand immediately above the Gordon, and in almost every instance gas from this formation has exhausted very rapidly, so much so that we do not consider it a permanent source of supply for market purpose, but when combined with the Gordon sand gas, from which sand we produce our oil in that field, it adds some to the main quantity and therefore makes quite a showing. I do not look upon the waste to the resources of the State in the same light that it impresses you, for the reason that where the gas is allowed to escape it cannot possibly be avoided where oil is likewise produced, and operations for the latter product cannot be carried on without developing conditions of the kind referred to, which from their very nature are beyond the control of any appliances that have yet been devised. We would be only too glad if a remedy could be advanced to control the flow of gas you speak of, and at the same time separate it from the flow of oil without affecting the product we are so expensively seeking; you can readily see that it would be greatly to our interest, if for no other reason than the simple one of aiding us in lifting the oil to the surface in a more economical way than is possible with any mechanical power.

The features you speak of have to a greater or less degree been found in all oil producing fields, and as a rule where oil is found in proximity to gas, the oil product has generally been considered paramount to that of gas, as the benefits accruing from it were much greeater to the people at large. To give gas a commercial value it requires a costly plant to market it, as it very rarely can be used locally in any quantity.

We have endeavored to preserve the gas in all instances where it could be practically done. You are sufficiently familiar with our operations to understand that where we have drilled a gas well to the Gordon or any other sand, it has been a rule without exception to case the well and shut the gas in as speedily as possible, thus preventing needless waste, at the same time recognizing the value of gas and also the fact that the loss is greater to us than it possible can be to any one else.

We shall be glad to receive any suggestions from you that would aid in accomplishing the purpose we are all so much interested in.

Yours respectfully,
(Signed) N. F. CLARK.

Another letter from each party was written on the subject, but nothing came of this first attempt to conserve the natural gas supply of the state, since it was recognized that Mr. Clark's letter voiced the attitude of most other oil companies and individuals operating within the state.

Recognizing the enormous drain and waste of our richest mineral possession, your speaker brought the matter to the attention of the State Legislature in his first biennial report thereto in 1898, hoping that some legal remedy might be found, and has continued so to call the attention of that body to this waste in every biennial report, but the same forces that refused to bottle up the escaping gas were more successful in throttling all attempted legislation, so that nothing has been done, and much preventable waste though in gradually diminishing quantity still continues. The rapid progress of the manufacture of gasoline from the gases hitherto escaping to the air from oil wells has done much to educate oil well operators to realize the great value of the wasting gas, and it is confidently hoped that long before all these precious hydro-carbons are gone forever, the operators will realize that they can no more afford to permit any kind of good natural gas to escape into the air than they could afford to let their petroleum continually flow out of the wells onto the ground instead of into good storage tanks whence it can be safely transmitted with a minimum of waste into the world's commercial business. If this hoped for day shall soon dawn in the conservation of West Virginia's natural gas resources, it is possible that her supply may not be entirely exhausted even half a century hence. Some recent gas wells found in southern Kanawha and northern Logan point to a possible enormous addition to the gas bearing area of the state, especially in the region south and southwest from the Elk and Great Kanawha rivers, and with the possibility of developing still lower gas reservoirs with vast rock pressures in the untested horizons below the Bayard Sand down to the Clinton, or even Trenton, containing geologic strata that have proven so rich in hydro-carbons across the river in our sister state of Ohio, there do not appear to be any valid reasons why my native state from which more natural gas is now marketed than from any other in the Union, shall not long continue to supply this precious fuel, not only to her own citizens, but to those of her neighboring sisters as well. If the splendid men who constitute the Natural Gas Association of America could be induced to lend their great influence individually as well as collectively to the proper conservation of the natural gas supply in every state where it exists, there can be no doubt that such action would prove of untold benefit to the industry in particular, as also to the welfare of the Nation in general by prolonging many years the date when these priceless gases, so rich in heat units shall cease to flow from our mother earth.

In the production of natural gas for the market, West Virginia was the banner state of the Union in 1909, and very probably in 1910 also, although in both years a very much larger quantity of gas came to the surface in Oklahoma, the most of which went on into the air unused in connection with the production of petroleum.

The quality of West Virginia natural gas is shown by the following table of analyses taken from Volume I (A), W. Va. Geol. Survey, page 556, and show it to be unexcelled in heat units:

EXHIBIT OF THE NATIONAL TUBE COMPANY, PITTSBURG GAS SHOW.

	1	2	3	4	5	6
Carbon dioxide (CO_2)	0.006	0.1	0.0	0.0	0.1	0.0
Carbon monoxide (CO)	0.4	0.4	0.4	0.4	0.4	0.5
Oxygen (O)	0.2	0.2	0.2	0.1	0.3	0.3
Hydrogen (H)	trace	0.2	0.0	0.1	0.1	0.0
Heavy hydrocarbons	0.4	0.2	0.4	0.2	0.1	0.2
Ethane (C_2H_6)	14.60	14.09	15.09	14.88	14.35	7.65
Methane (CH_4)	80.94	81.60	79.95	80.85	80.70	6.48
Nitrogen (N)	3.46	3.21	3.96	3.47	3.95	4.87
Ammonia (NH_3)	none	none	none	none	none	none
Carbon bisulphide (CS_2)	none	none	none	none	none	none
Sulphuretted hydrogen (H_2S)	none	none	none	none	none	none
Moisture (grains in 10 cu. ft.)	17.72	....	....	....	....	....
Total Sulphur (gr. 100 cu. ft.)	0.182	....	....	....	....	....
Total paraffines	95.54	95.69	95.04	95.73	95.05	94.13
B. T. U. per cu. ft. (calculated)	1142.6	1136.9	1140.9	1143.6	1131.4	1065.3

Sample No. 1—Morgantown supply (Big Injun Sand), Monongalia and Green (Pa.) Counties.

Sample No. 2—Fairmont supply (Bayard Sand), Marion County.

Sample No. 3—Big Injun Sand gas from Lucas Bros.' well No. 1, near Shinnston.

Sample No. 4—Gordon Sand gas (Shinnston supply), from J. B. Cunningham well No. 1.

Sample No. 5—Fifth Sand gas from Harbert well No. 1, near Lumberport, Harrison County.

Sample No. 6—"Fifty-foot" Sand gas from Lucas Bros.' well No. 4, near Shinnston, Harrison County.

Discussion:

President Garard: Gentlemen, you have all heard Professor White's remarks. I think there is some credit due to me for the Professor being with us. I met him some time ago on the train going to his home at Morgantown; I was going to Uniontown. I asked him why it was that he had not become a member of our Association. I told him on account of his long years of service he should have been a charter member. I told him of our intended meeting at Pittsburg, and that we would very much enjoy a paper from him. He kindly consented to write one, rather reluctantly. I had not more than reached home until I received a letter from the honorable gentleman, saying that he had duties elsewhere and that he would have to decline. I told him, however, the word had gone out broadcast throughout the land that he was going to prepare a paper for us, and it would simply be a fatal blow to the Natural Gas Association if we did not get it. He very cheerfully came back and said under the circumstances he would prepare such a paper. He did so, although our worthy secretary, Mr. Jones, had a good deal of trouble in getting it from him finally. He has given us the credit of having the most persistent secretary he ever came across. He said he simply had to give him some "dope" in order to get rid of him.

We are certainly glad to have the Professor with us. I have known him for many years. We were children together in the early stages of the oil and gas business. As I say, I have known him for many years, and very pleasantly.

If there are no questions to ask the Professor, or no remarks on his paper—

Prof. I. C. White: I would like to make one statement. I have called attention to the possibility of reaching the Clinton sand in Ohio; the one that produces so much oil and gas—oil especially—in the region of Bremen. I have always held to the theory that it could be reached along this great Burning Springs arch which you see here; and also in this district here; I think within a depth of 4,500 feet. Near West Elizabeth the Forest Oil Company drilled a well at this point to a depth of 5,575 feet, 1,000 feet deeper than it would be necessary to go here in order to test the pressure of the Clinton sand. I think there are several wells in this country at least that deep. There is one at Wheeling 4,500 feet deep, and it was drilled without any difficulty at all; while up here in the Panhandle you would begin 600 or 800 feet under the Pittsburg coal, so that there is a probability that you would have a thousand feet less to drill there. Here in the Kanawha field I think it is possible to reach it. I do not think you can get anything in the immediate valley of the Ohio where the rocks are nearly flat, unless it is devoid of water. If it is devoid of water there you might get a big pool of oil, so that when some of the men connected with these great corporations are drilling wells in these regions which are described in this paper, probably they will go down and see what is in this Clinton sand. It may result in prolonging the life of our oil and gas territory for many years. And of course between the Clinton sand and the Berea Grit, which is the lowest oil producing rock southwest of the Little Kanawha, you may get other oil and gas horizons just as you have in Ohio, in what they call the "Big Lime;" not our "Big Lime," which is just above the "Big Injun" here—but below that and which is two or three thousand feet below our "Big Lime."

F. L. Chase: I would like to ask Professor White the geological explanation of the experience we encounter in the Clinton rock of Ohio so frequently showing a total absence of gas within a very short distance of where it has been found in abundance, and where the rock seems to be uniform, continuous and level, showing no irregularity of dip or general contour. It would seem if that has escaped through a fault in the rock, why is there no trace of it left, or what is the geological explanation of its entire absence?

Prof. I. C. White: Replying to that question in general terms, I would say most all of these oil and gas sands are old beach deposits. For instance, this Clinton stone is the Medina sand stone of New York, which you find at Medina Falls, and they quarry it out there for various purposes. It is also found at Wills Creek Cap, Maryland, and other points, where it is used for railroad ballast. If you examine these grains of sand you will find that they are rounded, beach worn; and you will find in the sand rock itself evidences of sea weed, and also evidences of the animals that lived in the sea at that time. Now, if any of you go along the beach at Atlantic City you will find sand of the same character. Of course, you have a considerable stretch there where you have pure sand, free from mud. That would make fine oil sand. But when you go where one of these little drainage inlets comes, you get into the mud; and instead of having open, porous sand which would make a good reservoir you have a mixture of mud and sand, which would make a very poor reservoir. It would not hold anything. And I take it these ancient beaches, which were formed in the same way as the modern beaches, were very much of that same character. They had their inlets and the streams that came down from the upland carrying mud and sediment with them; so that where you have gas sand of that kind it is possible that a condition would exist such as I have suggested. You will remember at the famous Mevey well, producing 600 or 700 bbls. per hour, within 300 feet of it was drilled a dry hole. The reason, of course, is that that old beach deposit was modified at that locality by some mud deposits brought in from the land, or brought in by the waves themselves, so that the rock was made close grained, and the oil could not penetrate it. The oil saturates the rock where the rock is porous, but where the pores are filled up with clay and sediment and alluvial matter so that the oil can not get through, the oil is shut out; and I take it that is probably the reason for the situation that Mr. Chase mentioned in Ohio, or anywhere else. It is a change in the character of the rock from being porous into a rock that is non-porous. It is a change in the rock from being open and therefore capable of acting as a reservoir, just like a sponge holds water. But in a close grained rock those pores are filled up, and therefore the rock cannot hold much liquid or gas. Is that an explantion of what you asked for, Mr. Chase?

F. L. Chase: In my original statement I developed the fact that the rock seemed to be absolutely uniform.

Prof. I. C. White: It might be at that particularly point, and yet different a short distance away, so as to shut out liquids or gases.

G. B. Sipe: Professor White made reference to the wild gas well that was closed in the Caddo field. I guess it would be in order to make a brief statement with reference to it?

President Garard: Certainly.

G. P. Sipe: That well, although it was stopped from flowing gas, it was only temporary as it has to be killed every eight or nine hours. It begins to bubble in the crater after about eight hours, and they have to keep the pumps in readiness to start them again and pump them about an hour.

Prof. I. C. White: Let me ask if the other one is open; the one they drilled as referred to in the article contained in the Wrinkle Department?

G. B. Sipe: The other is open, but the gas of course is held down. The pressure is very low there; the pressure is almost off entirely. There is a little gas that escapes up through it, but when they start the pumps to working it will siphon down into the old well and it requires about an hour's time to do that. Then it will remain quiet for another eight hours, and then begin to bubble again. I think that that is just the filling of the sand with water. There is probably a little breach from the deposit to the crater that has been formed down in the well a short distance, and whenever the water gets to its level as it would when

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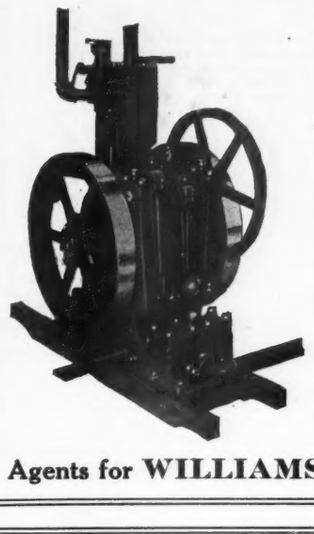

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the pumps are taken off, the gas accumulates there and begins to manifest itself again in the crater. That gas well, while it is under control to that extent, another well that has been going for almost the same length of time, and called the Salt Water well, just about two miles north of this old well, was seen spouting water about three minutes prior to the time that this well was closed up; and another well a mile and a quarter to the northeast of the old mud well is still spouting water and mud. It is discharging much more gas than the old well was at the time it quit. This well is still wild, and owing to the condition of that well I think it is hardly probable that it would be feasible to stop the flow of it by the same method that was employed in this other old well. So I think the problem has not been solved for the stopping of these wild wells in the Caddo field.

Prof. I. C. White: Instead of being killed, they have only been wounded.

G. B. Sipe: They are a menace to the gas sand there. Under existing conditions the escaping gas has been retarded very much by the discharge of water and the heavy flow of water. The amount of gas that was discharged under that load of water was comparatively small, but the amount of water going into the sand is very great. There is no doubt there is a crater down at the bottom of that well, owing to the pipe remaining in the well. No doubt there is a crater there equal to the crater that is on top because there has been an immense amount of sand that has been discharged during all the time that the well was flowing—six years. I think there is ample work for you down there, Professor.

L. G. Kiskaddon: I would like to ask a question, and that is this: Whether this organization has taken any steps toward bringing about a legislation which would prevent the waste of gas in the field?

President Garard: I do not think so—thus far, no.

L. G. Kiskaddon: I should think it would be a very wise thing to do—of course, in the deeper fields. We do not run up against it in the shallower fields. Oftentimes you will find some man come in and work a well down; he doesn't have any tubing or anything of that sort; and those wells after they are put in are allowed to blow for a week or ten days, no attempt being made to shut them in. I believe there was a bill introduced in our Legislature on that subject, but what became of it I do not know. We never know what a Legislature is going to do; but I think there was a bill introduced in our Legislature which provided for a fine I think of $500 per day for allowing a well to blow after it was drilled in by not having the means of shutting the well in on the ground when it was drilled it.

G. B. Sipe: The state of Louisiana has passed a law that requires the owner of any wild well to stop it; and unless that is done the state will take charge of it and stop it at the expense of the owner. But I think the state runs up against about the same proposition that the owner does, and the well is still unruly.

Prof. I. C. White: Of course, you have conditions there that we do not have here. Your rock formations are entirely different from ours.

E. P. Fisher: I would like to ask Professor White if he can tell us something about the work that is being done by West Virginia in running level lines along the various strata to determine the height of domes.

Prof. I. C. White: I should say that our field men—my assistants are two engineers, one Roy V. Hennen, a graduate of the engineering department of the State University, and the other is C. E. Krebbs, of Charleston. Both have had practical engineering experience in the field, and they located these level lines. Take for instance the map of Marshall, Wetzel and Tyler counties. The records so far as they were obtainable were furnished by the different oil and gas companies, and they were checked with the outcroppings of the rocks themselves, and in that way was determined these domes, which you can see on these maps. Now, we are publishing a map just south of this point. I have grouped these maps you see into three counties. Here is the structural map of Pleasant, Wood and Ritchie counties, showing these domes. You will find domes along this Burning Springs ridge as shown by the structural lines indicated here. The one south of this tier of counties is now in the hands of the engraver and will be out in two or three months.

Now, if you are interested in getting any of these maps or publications touching the West Virginia Geological Survey, I have some pamphlets here giving a description of the publications which may be of assistance to you in knowing what you can get. We are preparing to do just as much work as we can get along that line, and as accurately as we can. In fact, we have bumped up against the government surveys, and in some instances find that they are incorrect. The government issued a publication in which they showed the oil and gas development in the western part of Pennsylvania, and one of the engineers of the Philadelphia Company, I think it was, wrote me when he was putting our map on the same scale as the government map that the structural lines would not fit; ours would not fit those of the government. He assumed of course that the government lines were correct and ours were not; but when he got through with his investigations he found that the West Virginia lines were correct and the government lines were wrong; so that we are trying to do very careful work in that line, and these maps that have been published will undoubtedly lead to the finding of a great many spurs from the older oil pools just like you are finding them here in Pennsylvania. We are trying to furnish the data by which you can search them out without so much drilling. That at least would aid you. On account of the waste going on, and the legislative inactivities to provide remedies, we are having an awful problem here in West Virginia. These lines here on this map represent a great coal district, and along here is where it fades out. There is none beyond. So that these dark places here represent the area of Pittsburg coal in West Virginia where it comes from Greene and Fayette counties over into West Virginia; and these other lines represent the oil and gas fields.

I have tried for years to get our Legislature to do something to mark these lines—mark these holes in the ground and to have the correct location recorded in the clerk's office just like a deed, so that the coal companies would have an accurate location of the abandoned wells upon which they could depend, but so far nothing has been done. It is very discouraging. There are coal fields in here that are practically untouched. The Fairmount people are shipping a little from it. The Pittsburg coal drops down so that it is a thousand feet below the valleys at the heads of the streams. The Pittsburg people will need this coal before the century is over, and when they come to mine it no one knows what will happen. We had an explosion in one of our Fairmount coal mines this year from a gas well. The gas was shut in. It was not a large well—it was a small well, and the gas passed through one of their mines and was shut in by some kind of a casing head that went over all the casings. The gas from this old well leaked up into the mine; not only that mine, but one 1500 feet distant. The result was an explosion; three men were killed and several injured. Fortunately, in the other mine 1,500 feet distant, while there was an explosion, yet no one was killed. But you can readily see the liability to danger from the opening of this immense coal area, which is of untold value. There are billions of tons there. These people who are in the mining business know the dangers of an effort to operate a mine of that kind under those conditions where you have to go down several hundred feet, and where you have to have your main entry and cross entries, and if you do not know when you are going to run against an abandoned oil or gas well with its attendant dangers, you can readily see the obstacles there are ahead of the miner who undertakes to mine that coal. Right in this field here below Burton, in one of the first wells drilled below there, good Pittsburg coal was found 700 feet down. They got so much gas in it that the heating and lighting of the village was continued for years from the use of the gas which was liberated from the coal itself. I think they are still using it. It came right out of the coal. So that there is enough gas in the coal where it lays deep that will require all the ingenuity of the mining engineer to take care of the gas. It is marsh gas. The situation is complicated by these almost numberless oil and gas wells which you are liable to run up against at any time; wells which have been abandoned without sufficient plugging, and there is no telling what will happen in that whole area when an effort is made to mine that coal amounting in value to billions of dollars. Yet, a great deal of it could be prevented by legislation compelling them to plug these holes properly. I think the only way to do it would be to fill them up with cement. That is the law in the old country. For instance, in France if you make a hole in the ground you have to fill it up. I saw a coal mine there two hundred feet deep being mined where they took off about 350 feet of hill in the form of terraces; but they used rubbish to fill up the hole they made in taking the coal out. But if they do go underground and take out a rock they have to put rock back, so that the surface will not subside. So that when these oil and gas men drill a hole through valuable coal where it is liable to let gases loose to the peril of the helpless miner, they should be required to leave that well in such a condition that all danger from the mining of the coal will be eliminated, because there is no permanent record of where those wells are located, and even the recollection of man as to where the wells are located will be lost in a few years. Otherwise, the miner does not know when he is going to run right into one of these abandoned oil or gas wells and hundreds of lives may be imperiled by one abandoned well. There is much needed legislation along this line, not only for the protection of the oil and gas, but for the protection of the coal interests. I tried to get something through our Legislature the last time, but the Interests, as they call it—the coal men and the oil and gas men—said there was nothing to it, and my efforts were unavailing.

M. M. Sweetman: May I ask Professor White if that gas that is coming from that coal mine you referred to, and which is supplying the small village, has ever been analyzed so as to determine whether it is gas coming from the coal or gas leaking from a gas well?

Prof. I. C. White: Only from the character of the gas. It does not have the character of oil gas but it has the odor more of marsh gas, and therefore I concluded it was gas that came from the coal. They went down and got a little gas in the Gordon sand. Mr. Gibson, who drilled the well, told me about it and he said it didn't have the odor of gas before he went into the Gordon sand; and his conclusion was that it was marsh gas.

M. M. Sweetman: I knew of a case in Kansas where they drilled in a well and found an enormous pressure, I think something like 300 or 400 pounds pressure, at only 300 feet in depth; and they thought they had struck it rich and had found a large well; but it was under very tight rock pressure and it all blew out in a very short time, which indicated that it came from the high pressure and not from the volume of gas.

W. H. Hammon: Mr. Chairman, I want to say that I consider our Association has been highly complimented by securing Professor White to address us. I think he would have had a large audience to listen to his paper if it had not been published in the printed book of papers for this meeting. I know, however, that we are all very grateful to our secretary for insisting on a written paper, by which it could be presented to us in permanent form so that all of us could get the benefit of it. I think that we all appreciate the position of our worthy president when he takes unto himself the honor of having Dr. White with us today; and we also appreciate the efforts of our secretary in showing the insistence that he did in order to get the paper prepared for publication; and now I want to come into the fold and take my share of honor, for I want to say when the subject of the program was brought forward I was the first to suggest that Dr. White be asked to come and speak to us. (Laughter and applause.)

Now, I wish to make a motion to which I know every member here will be glad to respond:

I move that we tender a vote of thanks to Professor White for his very instructive paper, and for his interesting remarks.

M. M. Sweetman: I desire to second that motion.

President Garard: Gentlemen, you have heard the motion, which has been seconded. And right here I beg to say that I have been authorized by unanimous vote of the board of directors of this Association to recommend for nomination Professor I. C. White as an honorary member of the Natural Gas Association of America. (Applause.)

The above motion, having been duly seconded, was then unanimously adopted by a rising vote of the members.

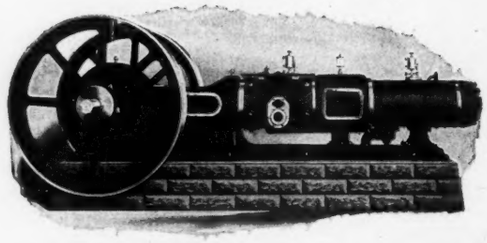
M. M. Sweetman: Mr. President, I move that the recommendation of the board of directors be adopted, making Professor I. C. White an honorary member of our association, and that we vote on the motion by rising to our feet.

Several Voices: I second the motion.

President Garard: Gentlemen, you have heard the motion, which has been seconded, that we all show our appreciation of the recommendation of the board of directors by giving an unanimous vote to the recommendation of the board of directors for the election to honorary membership in our Association of Professor I. C. White, and I want to add that we feel honored by having him with us.

The above motion was then unanimously adopted amid applause, by a rising vote of the members present.

Prof. I. C. White: Gentlemen, I certainly thank you from the bottom of my heart for this kindly act on your part. I have given many years of thought and study to the oil and gas industry, and it has always been my pleasure to aid you in any way I could. Anything I can do in the future—while I am not as young as I look—still, I am in the ring to help you. I propose to still continue doing all the work I can along scientific lines and other lines to conserve these precious oil and gas resources and to make them last as long as possible, and also in getting the fullest utilization of them while we have the opportunity to use them. I certainly thank the Association for your kindly act. (Applause.)



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And thereupon, on motion duly made and seconded, the Association adjourned until Thursday, May 17, 1911, at 10 o'clock a. m.

THIRD DAY.

Thursday, May 18, 1911.

After calling the Association to order, President Garard said: Gentlemen, in accordance with our program, the first and only paper at the concluding session of the association is by Mr. R. B. Woodworth, on the subject, "Steel Derricks and Drilling Rigs."

I take pleasure in introducing to you Mr. R. B. Woodworth, engineer, Carnegie Steel Company, Pittsburg, Pa.

STEEL DERRICKS AND DRILLING RIGS.

R. B. Woodworth.

The statistics of industries are commercial. They deal with the quantities produced and their values, but take no account of the brains and inventive genius which are involved in the production of quantities and values. They have to do with things and not with men.

The history of an industry, however, deals with the men whose inventive genius and mechanical skill are the causes which account for its growth and development, and as I understand the matter, it is the purpose of this Association to take account of the human factor in the development of the natural gas industry and to record the mechanical devices and improvements which have been made in its course.

Statistics are easy to obtain. The annual volumes of the United States Geological Survey will give you the petroleum production of this country by years since 1859, and exact values year by year for the production of natural gas since it began to have a commercial aspect.

Mechanical devices and improvements in mechanism are made gradually and little or no record kept of their histories. Patient investigation in the patent office will ofen give a more or less vague clew to the date when certain methods and mechanism were introduced. More frequently the real ideas which lie back of any piece of mechanism or its use are not recorded in the patent office or in the history of a subject unless the improvement in question has been recognized to be so important as to carry with it for ages the name of the man that made it.

The history of derricks and drilling rigs is in such a case. There has been a continual evolution from the simple and primitive to the complex and scientific. The present paper deals with improvements in the structures on which drilling methods depend, and will mention such structures as the speaker may have happened to discover in the course of his investigations and will draw from them such lessons as the design of those structures may point, in the hope that those who have real knowledge of men and events and things in this industry may supplement, complete and perfect the story of human invention as it has to do with the development of drilling methods and mechanism in the exploitation of our oil and gas resources.

The Art of Well Drilling.

The drilling of wells began with the need of men for pure water and the art of drilling is, therefore, not to be counted as among modern industries. The only thing recent about it is its application to the exploitation of our oil and gas resources contemporaneous with the discovery that oil and gas were useful substances and not products which interfered with the good quality of salt water and the safety of the manufacture of salt water into salt.

The early methods of well drilling were quite simple. The first artesian well put down in the United States was drilled for salt by David and Joseph Ruffner at the Salt or Buffalo Lick near Charleston, W. Va., in the Great Kanawha valley in 1806, 1807 and 1808. Their 2½" chisel bit of steel attached by a rope to a spring pole drilled a hole into the salt sand and on January 15th, 1808, an ample flow of brine for their salt furnace rewarded their efforts. Their appliances were most simple. Their walking beam consisted simply of a spring pole mounted in a forked stick of wood, their bits were primitive, their cables of mere rope and their casing consisted of two long strips of wood whittled into half tubes and wraped with twine, and yet from this primitive beginning the cable system of deep well drilling takes its rise.

A tripod set up over the well hole for the handling of tools came as a later adjunct and afterwards the four-legged braced derrick as an essential feature of the drilling art; how soon I do not know, but it is a matter of history that it appeared on the labels pasted by Samuel M. Kier on the bottles of petroleum which he sold in 1846 and later years for their wonderful medical virtues, and that it was the right of one of these labels and the words "four hundred feet" thereon which gave George H. Bissell the inspiration to undertake the organization of the Pennsylvania Rock Oil Company under whose auspices Edwin L. Drake drilled the famous well at Titusville; so that by Drake's time the cable system of well drilling, with the string of tools, cleaning devices, raising and lowering mechanism, casing, etc., had been much perfected and developed later in drilling for salt water.

The first derricks McLaurin tells us in his "Sketches in Crude Oil," page 81, were of poles, 12 feet base and 28 to 30 feet high. The ladder was made by putting pins through a corner of a leg of the derrick. The samson post was mortised in the ground. The band wheel was hung in a frame like a grindstone. A single bull wheel made out of about 1,000 feet of lum-

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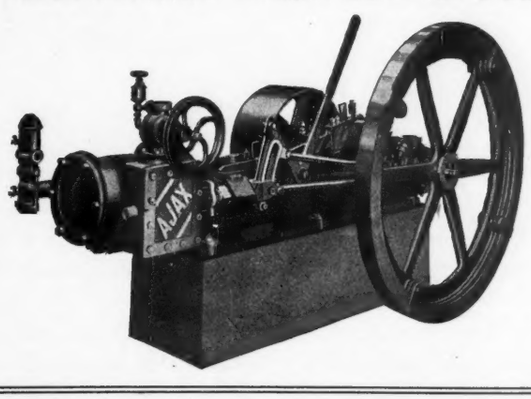

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DRILLING AND FISHING TOOLS

ber placed on the side of the derrick next to the band wheel, with a rope or old rubber belt for a brake, was used. When the tools were let down the former would burn and smoke and the latter would smell like ancient codfish.

In bridge and building construction American methods of design are recognized as pre-eminent the world over by reason of the standardization of all details, which permits the rapid execution and shipment of fabricated materials, and the first designer of steel derricks and drilling rigs may have thought that he could design a standard steel rig which would suit any and all conditions. He very shortly discovered that the rigs which were in use in different fields were not all alike and that each particular kind of field needed its own particular design. The slight variations which he found in different sections of the country he may have considered as due to the whims and fancies of individual drillers, but ere long he made up his mind that there were real needs back of these apparent whims and that the reason for these slight variations was due to necessity for adapting the outfits to special conditions, and that there was no general design which could be fitted to all conditions. It took the designer of steel rigs some time to find this out and the comparatively slow introduction of steel as a substitute for wood in drilling outfits is in a measure due to the failure of the steel man to appreciate the real needs and wants of the users.

It may be worth our while to mention the considerations which are now known to influence the design of satisfactory outfits. Viewed as structures, the variation in the sizes, heights and character of the derricks and other parts of the drilling mechanism are due to the methods of drilling, depths of wells, character of the strata and the purpose for which the rigs are to be used.

1. Methods of drilling: Modern drilling methods are divided by Isaiah Bowman, on page 32 of Water Supply Paper No. 257, United States Geological Survey, on Well Drilling Methods, into three chapters—percussive, hydraulic and abrasive, to which may be added the minor methods of boring, driving and punching.

The percussive method consists in the use of a heavy drill bar or other tool with suitable apparatus for lifting it and allowing it to drop so as to pound the rock into fragments small enough to be readily removed from the hole.

The hydraulic method uses water under pressure to loosen the material and bring it to the surface, either in combination with a drill shoe attached to the lower end of a tube and revolved by some method of rotation, as has been developed chiefly in Texas, or else by means of the appliance known as the sand pump, which is used not only in well drilling, but in sinking piles and in other engineering work.

In the abrasive method the rock is worn and chipped off by the rotation upon it of a shoe or bit armed with some harder material, and this method of drilling is more common in metal mining, core drilling, etc., than in the exploitation of oil and gas, though even the abrasive method comes into use occasionally in difficult fishing jobs.

The principle of percussion is utilized in all the cable and pole tool systems of drilling, of which there are various well known classes; namely:

A. The standard cable system as used in the Appalachian oil and gas fields.

B. The portable drilling machine.

C. The Canadian pole tool system in which stiff ash rods are substituted for the manila drilling cable.

D. The self-cleaning or hollow rod system which embodies the essential feature of the percussion methods generally, but differs in combining in one operation the breaking up and removal of the material.

E. The California system which differs from the standard system in the use of supplementary bull or calf wheel to operate the strings of casing.

F. The Galician system, which is distinguished from the Canadian pole tool system in the use of light iron rods instead of ash poles.

G. The Russian freefall system, which is a modified pole tool system adapted to large diameter wells and to strata of a specially caving nature, and in which the jars of the cable system have been replaced by freefalls and guides.

Hydraulic methods of drilling may further be subdivided into—

A. The hydraulic rotary system for use in formations composed of soft sedimentary deposits or beds of sand.

B. The jetting method for sinking water and other wells in unconsolidated deposits and in which the water jet receives little aid from the drill in loosening the material to be moved.

C. The combination system for localities where both hard formations and soft sedimentary deposits are found and which consists in the use of the hydraulic rotary system in conjunction with the derrick and tools of the standard cable system.

D. The stove pipe and mud scow system for use where glacial drifts, boulders or heavy gravel beds are encountered and which is particularly adapted for sinking water wells where the chief desideratum is a large supply obtainable only from a well of large diameter, and in which the mud scow combines the properties of a cutting bit and a sand pump.

Abrasive methods of drilling can be classified as to the kind of material utilized in the drills:

A. Diamond drills in which the drilling is done by bits with inserted carbons or borts.

B. Calyx drills in which the bits are made of hardened tool steel and consist of a toothed collar with long barrel and teeth, somewhat similar to the cutting shoe of the hydraulic rotary system, the teeth being so set as to provide clearance to the core and to the drill rods.

C. Chilled shot drills in which, under the weight of the drill, shot bite into the rock and chip out or wear off small pieces of it which are brought to the surface by water current.

The abrasive methods of drilling are chiefly employed in exploration work in metal mining and need not further concern us here, though occasionally some form of abrasive drilling may be satisfactorily employed for special purposes in oil and gas work.

With the abrasive method of drilling the tripod used with the time honored spring pole of which we read in ancient books is still in use, though there are indications that eventually some form of four-legged braced derrick may be used in the drilling of the deeper bore holes. Some form of four-legged derrick, however, is used with all of the percussive and hydraulic methods, with the possible exception of the jetting methods, which are not in much favor for drilling for oil and gas wells. It is obvious that the structures used to house the tools and to form the frames in or on which the tools operate vary with these different methods of drilling. They are most simple with the abrasive type of drilling methods and most complex with the Russian freefall system of percussive drilling.

2. Depth of Wells: Oil and gas have been discovered in almost every geological formation from the crystalline rocks of the Archean Complex up to the sedimentary strata of the Pleistocene, and the possibilities of their occurrence seem to be limited only by considerations of the existence at any periods of plant or animal life.

The depth of wells vary greatly. The famous well dug by Col. Drake at Titusville struck oil at 69 feet. The deepest bore hole in the world is that completed in August, 1893, east of Rybnick, Upper Silesia, Germany, to a depth of 6,572 feet. The deepest well drilled with a cable in the search for oil, which is at the same time the deepest well in the United States and the third deepest well in the world, was put down by the Forest Oil Company in 1898 on the William Bedell farm 2½ miles west of West Elizabeth, Pa., and discontinued at a depth of 5,575 feet. To drill this well required extra heavy machinery, consisting of two 25 H. P. engines and boilers, three bull ropes, 16" belt, 13½ ft. band wheel, 5" forged shaft, two brakes on the bull wheel and two cables spliced together. The weight of the cables alone was about 9,000 pounds.

The average depth of 24 wells in the Blossburg formation is 599 feet. Average depth of 65 wells from the Atwell sand in the Gaines pool, 828 feet. Average depth of wells recorded in Butler county in the Catskill formation, 1,596 feet. Average depth of 170 wells in Greene county, 2,961 feet. Average depth of 322 wells in the Amity Quadrangle, Washington county, 2,500 feet; shallowest well, 1,400 feet deep in the Big Injun; deepest well, 3,137 feet in the Elizabeth sand.

In Ohio the average depth to the Berea sand in Harrison, Belmont and Guernsey counties was 1,577 feet. In the Steubenville Quadrangle 37 wells found this sand at 1,392 feet.

In central Indiana 74 wells found the Trenton limestone at an average depth of 1,113 feet. One hundred and thirty-seven wells in the Princeton field found the Huron sandstone at an average depth of 905 feet. In Jasper county, Indiana, a well drilled in 23 hours found the corniferous limestone at 110 feet; the same limestone is reached at Terre Haute at 1,650 feet.

In Illinois 30 wells in Casey county found oil at 398 feet; 29 wells in Crawford county at 963 feet.

In Kansas wells reached the Cherokee shale at Coffeyville at 600 feet, at Independence about 525 feet, at Chryvale 750 feet, at Neodesha 850 feet, and at Bolton 1,150 feet.

In Oklahoma the average depth of wells is 1,000 to 1,100 feet. The upper sand is frequently found at 800 feet and the lower sand at 1,700 to 1,800 feet.

At Anse La Butte, La., the wells run from 593 feet to 801 feet. In the Jennings field the average is 1,845 feet.

At Spindle Top, Texas, the shallowest well is 772 feet, the deepest 1,111 feet. In the Sour Lake field the oil is found from 230 to 1,400 feet, and the deepest well is 1,612 feet. In the Batson field wells run from 791 to 1,159 feet, averaging around 1,100 feet.

The shallowest producing wells in the United States are probably in Nacogdoches county, Texas, in which field the wells run from 70 to 200 feet in depth, in the large majority of cases not over 100 feet.

The wells of California are found in the cretaceous, and the deepest producing well in the world is believed to be that of the Los Alamos Oil Company near Los Alamos, Cal. It is 4,350 feet to the bottom and required two years in drilling.

In West Virginia wells run all the way from 295 feet in the Carroll sand, Ritchie county, to 3,631 feet in the Bayard sand, Monongalia county.

The shallow wells can very readily be drilled with a portable drilling machine of the very simplest type. The deep wells require long and heavy strings of tools and heavy casing which bring enormous loads on the derrick as well as on the operating parts of the drilling mechanism. Col. Drake's derrick was about 34 feet high. In California long strings of tools and casing have brought the introduction of derricks 106 feet in height. The Russian drilling outfits require derricks of such height to accommodate their long lines of drilling rods, freefalls, guides, sinker bars, underreamers, etc., as to justify the building of an upper extension story to the derrick proper.

3. Character of Strata: The character of the strata penetrated by the drill while it most immediately concerns the operating mechanism and the kind of tools used, has also a bearing on the structure itself, not so much as it affects the height of the derrick, but as it affects its strength and the stresses it needs to sustain. The rocks of the upper Appalachian field lie almost level and are hard in texture, so that the drill can penetrate them and leave a vertical self-supporting wall even though drilled wet and full of water from the top to the bottom, and, therefore, casing may be placed in position with great uniformity, precision and straightness so that when it is removed the stresses on the top of the derrick will be direct and steady. In the West Virginia field the methods in use in Venango county proved inadequate for drilling through sand and shales that broke, caved and fell into the wells, with the consequence that endeavors to drill in that field in the early days nearly always ended in getting the tools fast and the holes plugged. It is a matter of history that when the Pennsylvania drillers who had successfully penetrated the hard rocks of the Subcarboniferous Catskill formation went down to West Virginia and attempted to drill through the much higher and softer series of rocks in the Permian and coal measures, the results in most cases were failures and the oil development of West Virginia was delayed 30 years until the drillers learned how to deal efficiently with the conditions in that field. In California the strata lie at high inclinations and the rocks are soft and cave readily. It is, therefore, necessary to provide means for the underreaming of material in order to maintain the well in a vertical position and to handle not only larger sizes of casing than are customary in the Appalachian field, but also to handle them with supplementary bull wheels or calf wheels, etc., in order to maintain not only the alignment of the well, but its very existence with the utmost dispatch.

Again, the hydraulic rotary method practiced in Texas demands in many instances the possibility in the drilling rig of quickly shifting from the rotary to the cable system and vice versa, and the methods which may be successfully followed in the Beaumont field through the alluvial formation of the Mississippi delta and the Coastal plain are entirely different from those which can successfully be employed in Terrebonne province of southern Louisiana where the wells go down through enormous thickness of sulphur beds, rock salt, etc. It is quite different to drill through 2,800 feet of solid salt or 600 or 700 feet of sulphur from what it is to drill through 3,000 feet of mixed limestone, sandstone and shales of the Carboniferous strata. The difference in the design of the drilling rigs and the equipment which may be employed is due solely to geological conditions, which must be understood before endeavors to find oil or gas can hope to meet with success.

4. Purposes of Use: The design of a rig is in like manner affected by the use to which that rig is to be put. If it is to be strictly portable, it must of course be mounted on wheels so as to permit easy transportation from one point to another. If it is to be used only in cleaning out wells, it need not necessarily be as strong and heavy as if it is intended for drilling. If the rig is to be used for pulling casing only, some tripod form of construction such as is in use in the Indiana field may be amply sufficient for the purpose. If the structure is to be placed over a shallow well in a warm, dry country, very little provision in the way of protection to equipment and men against the weather is necessary. If, however, it is to be used in drilling a very deep well in a cold climate where it is likely to remain a year and a half or two years at the least, then the protection must be adequate and complete. If the well is likely to produce enormous volumes of oil or gas and the derricks are very close together, the sheeting must not only be weatherproof, but fireproof as well, and the wooden sheeting needs to be replaced, as is quite frequent on account of the fire risk in the Russian fields, with sheet iron, uralite or some similar material either slow-burning or absolutely fireproof.

5. These different uses, methods and conditions mean different methods of construction. Drake's bull wheel was mounted on the walking beam side of his derrick; now they are put on the other side, etc., etc.

The walking beam in a standard drilling rig needs only to revolve in a vertical plane, whereas in a combination rotary outfit it needs to revolve in a horizontal plane also or else be capable of longitudinal displacement in the vertical plane of its ordinary operation. The walking beam in the standard rig is mounted on a samson post outside the derrick proper, whereas in the mud scow and stove pipe method the walking beam is placed on the top of the derrick. In the standard rig in like manner it is made of a symmetrical tapered shape to carry the pitman and the temper screw and mounted on the center irons at its middle, whereas in the Russian freefall system and in the Canadian pole tool system the walking beam is unsymmetrical, the end next to the well hole being very much shorter than the end towards the band wheel, and special arrangements must be made for slipper-outs, etc. In the Russian freefall system, again, the samson post is placed within the derrick. In the Canadian pole tool system it is outside, as in the American standard drilling rig.

The size of the bull wheel varies but little, 8 feet in diameter being the ordinary construction. The length of the shaft, however, does vary. In drilling deep wells it is desirable to have as long a shaft as possible in order to permit the spooling of the greatest possible length of drilling cable. In shallow wells the shaft may be made much shorter and at the same time the wheel can be made smaller. Differences in the length of the shaft mean differences in the arrangement of the bull wheel posts and their connections to the legs of the derricks. In like manner the use of a calf wheel modifies entirely the framing of the first two panels of the derrick on the walking beam side and changes as well the details of construction of the framing for the house. The gudgeons which are used on the bull wheel may be employed on the calf wheel, but the cants cannot, neither can the calf wheel posts be made like the bull wheel posts.

The same kind of a crown block will not do for the standard rig and for the California rig, nor will a four-pulley arrangement be suitable for use with triple casing blocks.

Again, in the standard drilling rig the casing is drawn in on the walking beam side of the derrick and provision must be made in the diagonal bracing for this purpose, whereas in the rotary method the casing is pulled in on what corresponds to the bull wheel side in a standard derrick and the framing which is suitable for the blacksmith shop side of the base must be modified and made amply strong to carry the weight of the pumps which are placed on that side in the rotary method.

In the standard rig one leg of the derrick is extended up to form a gin pole to handle crown pulleys, etc. In the rotary two legs must be extended up and an overhead joist put in for a similar purpose.

In the standard cable system the derrick is open. In the rotary system, as well as in the Russian freefall system, platforms must be provided at different levels for handling casing.

Steel Versus Wood.

These are a few of the conditions which confront the man who desires to introduce the use of steel in the construction of derricks and drilling rigs. They are not all by any means and are to be regarded only as samples of some of the things which the speaker has discovered in the actual designing and manufacture of this class of equipment. He does not say that he has met all these difficulties or has solved all of the problems in actual manufacture, but he does know that so far as he is acquainted with all of these various conditions which enter into the construction of derricks and drilling rigs, there is not a single one which is insuperable and not a single condition which cannot adequately and economically be met. All that is needed in the designing of these structures is to know what the conditions actually are and the requirements which must be met; the solution of the problem after that is most simple.

The advantage of wood in the construction of derricks and drilling rigs is that it has been very cheap and can be made to suit almost any conditions by building up pieces. If, by any reason, the rig builder makes the derrick too light and it begins to pull in or rack to pieces, anyone can take a piece of plank and nail it on in the right place so as to save the day. If the amount of wood used is too great for the load which it has to sustain, it does not make any particular difference and does not add a great deal to the cost of the outfit, the large item of expense being in the carpenter work rather than in the material itself, though today it behooves us to pay a great deal more attention to the economical use even of wood.

With steel, however, the situation is different. The material is worth more than the labor which is put on it to fit it for use and the designer, therefore, endeavors to use no more material than is absolutely necessary in order that the cost of the rig may be kept down to a low figure. It is quite necessary that his information as to the use of the derrick be exact so as to make possible the greatest economy in the use of materials. In thus fitting the various parts of the structure to their ordinary requirements he works along the line of the conservation of material. In endeavoring to design steel structures for the loads they actually have to carry it has been discovered that in quite a number of places the design of the wooden derrick and wooden rig is most wasteful, and that in working out steel structures the economies which may be effected in exactly proportioning the members to the work they have to do result, in certain instances, in producing members which cost even less than the wooden members which they duplicate. The samson post, for example, in a standard drilling rig is usually made of 16x16 inches white oak timber, and it is made so because with a walking beam 12 inches wide and standard center irons, at least 16 inches is needed to properly take care of the saddle blocks. A 16x16-inch samson post of white oak will stand a compressive stress of 91 tons, whereas the load which the samson post receives from the walking beam does not go beyond 17 tons under the most severe drilling conditions. The steel samson post may be made to carry the exact load.

The deterioration in character of the wood available for rig construction, its increase in cost and its lack of fireproof qualities are very much to its disadvantage for use under present day conditions. Besides which, with improvements in tools

and machinery, the art of deep well drilling has been established more nearly on a scientific basis. What is true in other industries should also be true in the exploitation of oil and gas resources; namely, that cheapness in first cost is usually commensurate with lack of quality, and that the purchase of the best may in the long run mean the purchase of the cheapest.

Conditions are somewhat different in oil mining from what they are in gas mining. In drilling for oil regard may readily be paid to the use of the derrick after the well is finished for the purposes of pumping and cleaning, though the speaker is firmly convinced that the most economical way in which to drill and operate oil wells is to drill with a standard drilling rig, to pump with a pumping jack and to clean with a portable machine. It is not usual, however, to leave the derrick standing over a gas well for either of these latter purposes, and, therefore, the question of reuse is of much greater importance than in the case of wells drilled for oil. A wooden rig of the usual type of construction may be taken down and used in drilling the second well. It is usually not worth anything after that except for kindling wood. The trouble with the steel drilling rig, from the standpoint of the manufacturer, is that the rig does not wear out and the fortunate possessor of one goes on drilling indefintely without needing any repair material from the manufacturer except occasionally a few bolts. Some of the rigs manufactured under the speaker's supervision have drilled six wells each and are just as good as the day they left the shop.

After all, the use of structural steel in rig construction is a very simple matter. No one needs to be afraid of it or to doubt his capacity to handle it just as he does wood. The tools with which it may be sawed, drilled and cut are a little bit different from those in use in carpenter work, but the job after all is a carpenter job. A man can bore holes in steel and saw the pieces up without expending any more work than is necessary in driving the augur or plane. Consequently the use of steel in building such structures is the replacement of wood by another material of exactly similar kind and which is fitted to sustain stress in exactly the same kind of way. The fact that anything which is required in the ordinary construction of a wooden rig considered as a structure may be exactly duplicated in steel is a vital point.

The steel rig comes to the rig builder's hands framed ready for use at the shop. It is put together just like the rig to which the builder has been accustomed, with the least possible delay and expense.

The exposed situations in which derricks are ordinarily located make them peculiarly liable to unusual fire risks. The steel drilling rig is constructed almost entirely of fireproof material, and the ordinary risk of fire has been practically eliminated. One of the steel drilling rigs owned by the Carnegie Natural Gas Company was struck by lightning which consumed a few wooden planks which happened to be laid down at the top and some flooring, but absolutely without injury to the steel structure. It is also apparent that inasmuch as a derrick is rigidly connected to the foundations and therewith can be brought into contact with the earth, it forms a conductor to electricity rather than a deterrent to its passage.

The exposed situations in which derricks are erected make them peculiarly liable to overturning under violent storms. It is obvious that this danger is very much lessened by the use of a material which does not expose, as compared with wood, more than 50 per cent of surface to the wind, and, therefore, offers much less resistance to the free passage of air.

Types of Steel Drilling Structures.

Drilling rigs may be divided into two classes; those which are mounted on wheels and are intended for transportation, by their own motive power or otherwise, from point to point without dismantling, and those which are either intended to remain permanently in the location in which they are first placed, or which may be removed from place to place only by resolution into their original component parts by dismantling.

The former class are usually known as drilling machines, while the latter class are properly denominated drilling rigs, the essential feature of the machine being its relatively compact character and its portability as a unit.

Portable drilling machines have been in use long years in a number of types. The operating parts have always been made of metal, and in the improvements which have been made the frames, etc., which were first made in wood have been converted into steel, though in some cases wood is still retained. The best known of these portable drilling machines are the Star, the National and the Columbia drillers. They are equipped for shallow well drilling only, though in a number of instances quite deep wells have been put down with them. They need not be further considered here for the reason that this paper

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has to do with drilling rigs rather than with portable machines, however interesting it might be to trace their development.

In the cable system of drilling the line of evolution as applied to the derrick as a structure, so far as your speaker can ascertain, has been as follows:

1. The spring pole and tripod.
2. The four-legged braced wooden derrick boarded to the top.
3. The braced wooden derrick with open interior roofed only to the second girt.
4. The four-legged braced wooden derrick put together with bolts to permit removal and re-erection.
5. The pipe derrick.
6. The structural steel derrick with long panels built after the ideas of what the designer thought the driller ought to use.
7. The structural steel drilling rig, the rig having short panels built along the lines of what the driller is actually using and which, by reason of long use, he prefers.

We will discuss here the last three classes in the line of evolution:

1. The Pipe Derrick: It was quite natural that the attention of the drillers should be turned to the use of steel pipe at an early stage of the game for the reason that round sections are well fitted theoretically to sustain compressive stresses and there were quantities of secondhand pipe to be obtained in all the fields quite cheaply. The difficulties in the construction of derricks did not lie in the legs, but in the other parts of the structure. So long as December 1st, 1885, patent No. 331,714 was issued to Alfred T. Hyde, of Oil City, for improvements in artesian well rigs, with especial reference to oil well drilling. Mr. Hyde proposed to construct a triangular derrick, the three legs of which were made of tubular posts and in which the horizontal members were made of pipe and the diagonal members of rods, the ends of both girts and rods being forged out flat and drilled for attachment to the legs through flanges and couplings.

The diagonal braces in the pipe derrick offer some difficulties, and with the use of swedged ends and the crude workmanship which went therewith it was necessary to provide some means of adjustment. Such a type of derrick is shown in the Oil Well Supply Company's catalog of 1900, page 12, which shows derricks made of pipe furnished ready to put together. The joints were made in slip sockets and keyed, no threads being used except on the turnbuckles of the stay rods which were made of iron or steel rounds. At the joints holes were cored in the castings to receive the ends of the diagonal rods on which dependence was necessarily placed for holding the structure together. The use of turnbuckles is expensive and the drillers never appear to have taken kindly to them.

The use of U-bolts, with or without forged clamps, for fastening members of the derrick together, appears also in derricks which have been actually manufactured and numbers of which have been in use. These forms are all crude and their workmanship cost was relatively high in spite of the fact that they could be made from secondhand pipe in field forges. The reason why such derricks are cheap is that the pipe costs nothing and many of them do their work not because of their fitness for drilling purposes, but simply by reason of the gracious dispensation of Providence.

Quite a number of pipe derricks of a very much improved type have been made under the patents of T. A. Neill, Field Superintendent for the South Penn Oil Company, and while this company have by far the larger number of such derricks, they have been extensively used by others. The Neill patent pipe derrick is made in different heights and with different thicknesses of pipe to suit different conditions. The design is flexible because the strength can be increased to cover requirements by using heavier weight pipe for leg sections, and this without any other change. There are no screwed joints, and it is assembled with clamps and bolts. It can be erected or taken down, so the manufacturer claims, in one day by three men. The clamps which were formerly made of malleable iron are now made of steel drop forgings of quite an ingenious type. The leg sections are plain, while the girts and diagonal braces, which are also of pipe, are swedged down at their ends so as to provide a flat bearing surface against the clamps and proper width of material for punching of holes through which they are connected to the clamps themselves. U-bolts connect the girts and diagonal braces at their intersections. Crown blocks may be made either of wood or of structural steel, and the design of structural steel bases for connection to the pipe derrick is quite a problem. The ladder in this improved type of pipe derrick is made of 1¼x1½" steel angles with ⅝" steel rungs and is connected to the girts by U-bolts.

It is obvious that in this type of construction the overturning of the derrick under wind or its pulling in by eccentric distribution of loads is resisted entirely by the friction of the clamp on the pipe, and in consequence there is need that the bolts should be well tightened. Nine bolts are used at each joint.

It is obvious that the use of steel pipe provides a very efficient leg section and that where secondhand pipe can be cheaply obtained and the blacksmith shop work, including the punching, done in the shops of the user, this form of construction would result in a considerable economy as compared with wooden types of construction. The derrick proper, however, is the only part of the rig in which pipe can be satisfactorily used, and in the case of derricks made of new pipe under ordinary methods of manufacture with proper allowances for shop profit, etc., the cost would be rather more than that of derricks made of structural steel. The use of pipe for building towers of this character, while it still persists to some extent in other lines of industry, has been definitely abandoned long since by the fabricating shops generally, for the reason that experience indicates the use of structural steel shapes to be more economical.

2. The Structural Steel Derrick with Long Panels: As already indicated, the first derricks made of structural steel shapes were designed by men familiar with the design of steel towers, viaducts, etc., which remain permanently in position and which are structures rather than tools. The first appearance of the structural steel derrick known to the speaker is on page 450 of a catalog issued in 1897 by the National Tube Works Company for circulation in Europe. This shows steel angle legs and girts with a steel base and crown block, the diagonal members being made of rods and adjustable by the use of turn-buckles. The description of this derrick is that it is "practically indestructible, is made of light pieces easily transported and handled, it is put together with bolts and can be easily taken down and moved from place to place and again erected." The ladder seems to have been made of wood and the impression made by the illustration of this derrick is that it was of a very primitive form. The panels, though, were made short length and the hights of the derricks were 60, 72 and 80 feet.

A cut identical with that shown in the National Tube Company's catalog appears also in the Oil Well Supply Company's catalog for 1900, page 13, with the additional information that the pieces were fitted, numbered and painted, that the parts presented but little surface to the wind, that the wind strains had been carefully considered, that there was no danger of the wind blowing the derrick over, that the derricks were made in any height from 40 to 72 feet, and that the construction was particularly adapted for use in hot countries where wood dries and decays quickly, and that "the first steel rig, all the parts being of metal, was sent to Australia to be used in a district where wood decays rapidly; the outfit gave complete satisfaction and drilled a number of wells."

In 1903 the local plant of a large fabricating company built derricks in heights of 50, 60 and 70 feet, tower fashion, with three, four and five panels respectively; that is to say, with panel heights on an average of 17, 15 and 14 feet. The weights of the derrick proper were approximately 9,000, 11,000 and 12,000 pounds. The legs were 5x5x⅜" angles, the braces 2½x2½x¼" and the girts 3x3x¼" and 4x4x5/16"; all connection plates ⅜" inches thick. These derricks had buttresses at the base on all four sides to prevent overturning. They needed for their erection gin poles or other similar scaffolding. They looked well on paper and the designer no doubt considered them an excellent thing for the purpose intended. The driller's opinion, for obvious reasons, was not favorable, and his opinion, after all, is the only one worth considering.

In 1903 the Carnegie Steel Company built for the South Penn Oil Company and the Carnegie Natural Gas Company twelve derricks which were used in the Pennsylvania and West Virginia oil fields. They were 80 feet high with a 20-foot base and were likewise constructed along the lines of the structural steel tower, the 80-foot derrick being built in seven panels averaging a little less than 12 feet in height. The derrick and base weighed 24,000 pounds, and provision was made at the top for the crown pulley and at the bottom for wooden bull wheel supports. They proved to be fairly satisfactory, were stiff and steady under strain and have been removed from their original location and re-erected in the drilling of more than one well. They were probably strong enough to drill a well a mile and a quarter deep. It may be noted in passing that the 80-foot derrick today is built with ten panels and weighs, including crown block, ladder and base, in the neighborhood of 15,000 pounds, and will drill as deep wells as any of these twelve ever undertook.

No endeavor was made in the construction of these derricks to design a complete drilling rig. The next step in this direction was taken in 1904, when for the Oil Well Supply Company the Carnegie Steel Company designed and manufactured a standard steel oil derrick, California type, 72 feet high with a 20-foot base, and the intention in the design which was produced at that time was to construct proper supports for the bull wheels, calf wheels, band wheel and sand reel. This derrick was likewise constructed tower fashion with six panels of an average height of 12 feet, requiring the use of a gin pole and scaffolding for their erection.

A number of improvements, however, were introduced in this rig in the arrangement of the crown pulleys and the supports for the bull wheel, calf wheel, walking beam, band wheel, etc., one of the most important of which was the location of the sand reel on the working line of the derrick as a definite feature in the rig. Instead of the derrick tapering continuously from the top to the bottom, the first panel was built square, which arrangement commended itself to the designer at that time as an opportunity of affording more room for working operations, which seemed to him to be required, and which has met with favor among some drillers while others have not considered it so favorably. The first derricks constructed under this design were shipped to South America for use in the oil fields of Argentina and Peru after the lower panel of one of them, with the machinery supports, sills, samson posts, walking beam and sand reel, had been erected complete in the shop for the proper adjustment of all the working parts. The derricks were shipped to New York via rail, thence by steamer to South America and were hauled inland 300 or 400 miles. The service which one rig rendered and its performance is clearly shown by the report of the driller: "I got the rig set up over the Acme Oil Company's drilling, a little over 1,100 feet deep, and drilled to a little less than 1,500 feet deep, when we had an English expert come out here to look over the ground and he decided on another location, and then we had to move the rig. This we did without taking down the derrick. We disconnected the sills under the samson and jack posts from the derrick and moved each of them intact. The derrick we moved on 4-inch pipe rolling on 3x6-inch plank and pulled with block and tackle, using two yoke of oxen for motive power. The band wheel was slung on two two-wheel carts and pulled by eight oxen. The boiler was also mounted and hauled by four yoke of oxen. We moved the whole rig in four and a half days and in two days more had begun work. The derrick can be tumbled around any way and does not spring or rack in the least. It surpasses all of our expectations."

3. The Structural Steel Drilling Rig: So far, so good. The next step in the use of steel was to build a rig complete with derrick, crown block, ladder, base, machinery supports, samson post, jack posts, knuckle posts, walking beam, bull wheel, band wheel, house framing, etc. This step was taken in 1908 when four 80-foot rigs were designed and built for the Carnegie Natural Gas Company for use in the Greene county gas fields of Pennsylvania and in Wetzel and Harrison counties, W. Va. The working parts of these rigs were built entirely of structural steel with the exception of the crown pulleys and the sand reel, which being already made in metal it was not necessary to re-design.

These rigs have given entire satisfaction. They have been removed and re-erected several times, and while improvments in minor details have been made since that time, the lines of their design are recognized to be in the main entirely satisfactory.

The improvements incorporated in the design of steel rigs are covered by letters patent No. 932,081 and No. 960,474 issued to the speaker and by other applications still pending.

Present State of Manufacture.

Improvements have been made in these drilling rigs from time to time, chiefly in the direction of the simplification of details and in the reduction of the weights to the absolute minimum, and while it is not necessary to record here the details of these improvements, this paper will not be complete without a description of the structural steel derricks and drilling rigs as now manufactured in their perfected form.

It is obvious that in a rig there are three main portions—the derrick proper with crown block, ladder and base, the machinery supporting sills with samson post, jack posts and knuckle posts, and the wheels, walking beam, pulleys, shafts and sand reel. These three parts are separate and distinct in themselves and it is obvious that it requires very little change to adapt the second and third divisions of the rig to any kind of a derrick, so that the machinery supports, etc., can very easily be used either with the wooden derricks, pipe derricks or the structural steel derricks, and, vice versa, the derricks can be used with other corresponding parts of a wooden outfit. This element of interchangeability has been taken care of in the design of the complete rigs, so as to make them an economical as well as a commercial success. As their operation is satisfactory to the driller, it is apparent that the design has solved the problem.

1. Derricks: In order to meet the requirements of deep well drilling, as well as the varied uses to which the derrick is put, three different forms are now manufactured in standard heights of 55, 64, 72 and 80 feet, two with rigid angle bracing and one with the diagonals made of rods, designated respectively after the names of their inventors as the Yorke, the Woodworth Standard and the Woodworth Oklahoma.

The Yorke derrick is made under patents Nos. 877,624 and 946,815 issued to Patrick Yorke, of Washington, Pa., who has made a reputation for himself as the producer of a number of improvements in well drilling methods during the thirty years of his experience. Mr. Yorke worked out his invention first with the idea of making an easily dismantled wooden derrick. His ideas have since been adapted to the steel construction.

The Yorke steel derrick was first made with the legs of structural steel angles overlapping each other at the joints, and the first derrick so constructed was completed on January 7, 1909. The joints are now made abutting. Connection gusset plates are riveted to the angle girts and are provided with slotted holes at the top and bottom with a round hole immediately at the joint. The diagonal members are likewise made of angles which are slotted at the ends to fit over the bolts which pass through the gusset plates and the legs. The bolts are put in the leg members and after the first insertion it is not necessary to remove them; the derrick is assembled and dismantled simply by loosening the bolts and by slipping the slotted portion of the girt gusset plate over the bolt in the leg below and the legs of the upper section over the slots in the gusset plates of the lower section. The diagonal members are then slipped over the bolts which are tightened up and the joint is complete. The Yorke derrick depends for its stability under overturning stresses or against the pulling in of the derrick by eccentric pulls on the casing on the friction at the joints assisted a little bit by the way in which the slots are made in the diagonal members. This principle did not seem very satisfactory at first glance, but the number of Yorke derricks which have been erected and placed in successful operation, have been dismantled and re-erected, demonstrate very conclusively that as a matter of actual practice sufficient strength and stability is attained that way.

The Woodworth Standard derrick employs structural shapes for legs, girts and diagonal braces, but differs from the Yorke derrick in that dependence is placed for strength not on the friction of the joints but on the shearing and bearing value of the bolts, the legs and diagonal members being connected to the gusset plates of the girts in the same manner as is customary in building and bridge construction generally. The derrick cannot be pulled in or overturned until the bolts are sheared off. The difference as compared with the Yorke derrick is that the bolts must be put in and completely taken out every time the derrick is dismantled, though of course they may remain in one of the members after the nuts have been screwed on.

The Woodworth Oklahoma derrick is made with the legs and girts of structural angles but with the diagonals of round rods of different thicknesses, depending upon their position in the structure. No turn buckles are employed with the rods, as the use of turn buckles has not met with favor from the drillers. The rods are threaded at their ends, run through holes in angle clips and adjusted in place by nuts.

2. Crown Block: The top of all three types of derricks is constructed of steel angles and plates on which is placed the crown block made of two steel beams connected together by steel diaphragm separators and connected to the top of the derrick by bolts through their bottom flanges. The crown pulley runs between the two beams, and the sand line pulley may also be placed in the same position or else sheaves may be suspended from the crown block to take the sand line. Babbitted metal bearings have been furnished for the crown pulley and the sand line pulley, but it has been found that the best way is to place 2x4-inch wooden strips on top of the steel, to which they are bolted, and have the pulleys run in these wooden bearings. When the calf wheel is to be used, extra channels are added on the outside of the two beams to form supports for the extra pulleys.

3. Ladder: The ladder is made of steel bars separated by rungs made of rods having two nuts on each end, one of which goes against the bar on the outside and one on the inside. The ladder is made 15 inches wide and is connected to the girts by angle brackets of such length as to hold the ladder firmly in position so far away from the diagonal braces as to prevent the feet of the workmen from being entangled therein. The ladders are made in double panel sections and can be erected as the derrick goes up or can be placed in position as the rig builders come down.

4. Base: The foundation for the Yorke derrick is constructed of channels, while the foundation for the other two types is made of light steel beams. The main function of the base is to hold the parts of the derrick together and to add stability. It is built strong enough to transmit the ordinary working loads to the four corners of the derrick, but needs to be supported immediately around the well hole by short wooden sills or concrete piers, as it is not figured strong enough to sustain the dead weight of long strings of casing.

The piers for the derrick base, in the most modern and approved type of use, are made of concrete. The corner piers are about two feet square at the top, about three feet square at the bottom and about three feet high, and may be made by the use of either wood or steel forms; so also may the two piers which support the central joists of the base at the well hole.

The weight of an 80-foot Yorke standard derrick, complete with crown block, ladder and base, is 15,050 pounds, that of the Woodworth Standard derrick is 15,650 pounds, and that of a Woodworth Oklahoma derrick is 12,100 pounds. The Yorke and the Woodworth Standard derricks are fitted for deep well drilling with long length tools and for the handling of heavy casing. The Woodworth Oklahoma derrick is designed for shallow work or for use in pumping and cleaning old wells.

These derricks are rigid. They will not spring and weave like a wooden derrick under heavy loads, but, with the crown block in the center of the derrick and the load distributed on the four legs of the derrick as it should be, will sustain safely any strain which ordinary drilling conditions may bring upon them. They have already drilled wells 3,800 feet deep.

Any one of these three types of derricks ought to be erected complete with crown block, ladder and base by four workmen in one day, and the workmen need no equipment for putting them together except a couple of wrenches apiece large enough to take 7-8-inch bolts.

5. Bull Wheel Posts: These derricks are made either for use with the complete drilling rig or for use with the other parts of the wooden rig. The bull wheel posts may be of wood or of steel. In the latter case they are made of steel channels which carry babbitted journal boxes and are con-

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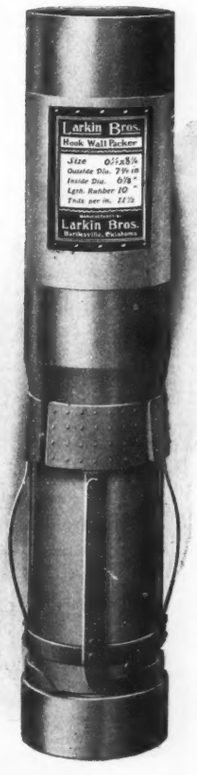

nected at their tops to an 8-inch I-beam placed two feet below the first girt, and at their bottoms to steel angles riveted to the base. They are also braced to the legs by a system of angle bracing which transmits the load directly into the base at the corner of the derrick and prevents any uplift on the girt itself.

6. Machinery Support Sills: The longitudinal machinery support sills are made of channels which are framed at their ends into the sill of the derrick and which rest at the samson post, jack posts and knuckle posts on transverse sills made of Carnegie I-beam cross tie sections to which they are connected by bolts. These cross tie sections are 4½" wide at the top, 5½" high and 8" wide at the bottom, which affords ample bearing surface for placing them immediately on the ground. The braces to the samson post, jack posts and knuckle posts intersect the longitudinal sill channels immediately over the transverse cross tie sills so that the reactions from the braces are transmitted directly into the ground and all the longitudinal sills need to do is to tie the entire machinery frame together.

7. Samson Post and Walking Beam: The samson post is framed of two channels tied together by batten plates and braced by three braces; one footing on the sill at the foot of the headache post, the other footing on the transverse sills at a common intersection with the front jack post brace, and the other a common brace between the inside jack post and the samson post.

The walking beam is made in several different sizes and weights and presents the same appearance as a wooden walking beam, being tapered both ways from the middle and is constructed of plates and angles, either in box form with two webs or in plate girder form with a single web. It carries at its end a bearing for the pitman and is slotted at the other end in the same way as a wooden walking beam to carry the temper screw bearing. It is mounted on standard center irons over the samson post.

The pitman has not yet been made of steel, neither has the headache post. It has seemed desirable to make these of wood, for obvious reasons.

8. Jack Posts and Knuckle Posts: The jack posts are made likewise of steel channels connected together by batten plates framed at their bottoms into longitudinal channel sills, and carry at their tops two standard bearings. The bearing of the outer jack post (that is the one farthest away from the walking beam) is made of two castings, top and bottom, babbitted. As the bearing of the inner jack post there is used for the bottom a standard jack post bearing and for a top bearing blocks of wood bolted down to bracket angles on the jack posts. It has been thought that the use of babbitted bearings over the inner jack post was not possible owing to the heating of these bearings in rapid running. Experience indicated, however, that these bearings could be made solid and that in fact the two jack post bearings could be made exactly alike.

The inner knuckle post is made of a steel channel framed rigidly both to the longitudinal channel sill and to the transverse cross tie sill. The bearing for the sand reel shaft is bolted to the knuckle post, but the hole in the post through which the shaft passes is made oval and provision made for the lateral movement of the bearing from its central position either 2" to the front or 2" to the back, thus making possible any necessary adjustment in the sand reel itself or even the use on the same rig of pulleys carying from 36" to 42" in diameter. The outer knuckle post is likewise framed direct to the sill and braced to resist movement. It carries at its upper end a pin on which revolves a swing lever which in turn is likewise made of a steel channel and extends upward to take the reach. No difficulty has ever been experienced in the proper adjustment of the sand reel or the band wheel, the pivoting of the swing lever to the outer knuckle post and the adjustment in the bearing at the inner knuckle post being sufficient for any probable or possible irregularities in alignment.

The back brake is composed of a wooden block carried by two angles pivoted to the sand reel sill and firmly anchored by tie rods to the jack posts in almost identically the same manner as is possible in wood.

It may be said in this connection that the endeavor throughout the construction is to utilize the bearings, gudgeons, rig irons, etc., that are customary in the use of wooden rigs, which permits the immediate replacement from any oil well supply store of any part which may be broken.

9. Bull Wheel: The bull wheel is constructed of a steel pipe shaft 16" or 18" outside diameter and ⅜" or ½" thick. It carries at its ends bowl gudgeons attached to the pipe by screw threads and held in place against turning by four tap bolts. The spokes in the first bull wheels made were constructed of 6" I-beams connected to the shaft through forged angle rims and set radially to the shaft. They are now made of steel channels bolted tangentially to the shaft, which method does away with the forging required in making the angle rings.

The brake wheel has a 9" face and is made with a plate rim riveted to the channel spokes and carrying wooden fillers which are properly curved for the braking.

The tug wheel is made in like manner to the brake wheel except of course that the cants are grooved and provision is made for the attachment of the wooden dog. The hand holds for turning the wheel are made of gas pipe bolted by ⅝" bolts through the entire thickness of wooden cants and plate rim.

The spool is made of steel angles bolted to the pipe shaft and connected to each other by gusset plates so as to form practically a single piece. In practice a few coils of drilling cable are wrapped around the band wheel shaft next the tug wheel and the brake wheel so as to prevent the drilling cable from coming in contact with the steel, otherwise the wheel is ready for use as it comes from the makers. The bull wheel is made 8 feet in diameter with double tug. Experience in the use of these bull wheels indicates most strongly that there is no better wheel made.

10. Band Wheel: The first band wheels were constructed of I-beam spokes, channel rims and standard cast flanges keyed on the regular band wheel shaft. The flanges of the channel rim were turned in and a canvas belt fastened to the outside so as to provide proper friction against the sand reel pulley. The cast flanges did not prove satisfactory and were replaced by solid steel flanges built up of several thicknesses of ⅛" and ⅜" plates, and then the flanges of the channel rim were turned outwards and filled with wooden cants, which gave better friction against the iron sand reel pulley. In both cases the tug wheel was made of a channel rim filled with wooden cants grooved for the rope and connected to the spokes of the band wheel by angle brackets. At present the band wheel is made with a cast iron center, channel spokes and plate rims between which are bolted both the cants of the band wheel itself and those of the tug wheel. There has not been at any time a question of serviceability of any of these various forms with the exception of the use of the cast flanges. These wheels have all given excellent service with the least possible expense in manufacture.

The band wheel was first made 11 feet in diameter. Experience in their use indicates that a 10-foot wheel on a steel rig is as effective a prime mover as an 11-foot wheel on a wooden rig, and in consequence they are now made 10 feet in diameter with a 12" face and a 7-foot double tug rim.

11. Sand Wheel: The sand reel used in the drilling rigs manufactured under the speaker's supervision is the ordinary California double drum reel which is set on the working line of the derrick. Any other form of sand reel can be used, provided this one consideration is kept in mind. The beauty of the construction as it has now been perfected consists in the fact that all the working parts are in one plane, and, therefore, it has been possible to eliminate indeterminate stresses in the members and to effect the utmost economy in manufacture, which, at the same time, means the least cost to the user.

12. Housing: The framing of the house is made of light angle iron carried by and supported on longitudinal channel sills extending from the sand reel sill over to the back of the engine house, which, together with the belt house, is entirely enclosed. This angle iron framing is punched with ¾" holes through which are bolted every four of five feet 1" pine strips to which the corrugated iron is fastened. The roof over the belt house and engine house has a slope of about 2" to the foot, while the roof over the blacksmith shop and bull wheel is much steeper. The roof in the derrick proper over the floor slopes from the first girt to the second. Openings are made therein for the drilling cable and for the lowering of casing. No. 20 galvanized iron is used throughout the structure. The corrugated sheets are attached to the wooden nailing strips by roofing nails, so as to be readily removable when drilling operations are completed. The only wood employed in the construction of the complete drilling rig is that used in the cants for the band and bull wheels, the planking of the derrick floor, the engine block and the nailing strips for the house, so that the entire structure is as fireproof as possible, almost as much so, in fact, as an office building.

The weight of a complete 80-foot drilling rig designed for the use of 4½" rig irons is about 48,000 pounds, including derrick, ladder, crown block, crown pulleys, wire line pulleys, brake band, lever and staple, base, machinery supports, house framing, walking beam, center irons, stirrups and bearings, bull wheel complete, band wheel complete with shaft and crank, 36" California double drum sand reel and about 38 squares of corrugated iron.

Material.

The steel used in the construction of these derricks and drilling rigs is that employed generally in bridge and building construction to manufacturers' standard specifications, and the loads are figured on the ordinary factor of safety of four used in structural steel work generally. The elastic limit is rather more than twice as high, consequently while the derricks may be used safely under the regular working loads for repeated steady stresses, they will withstand safely infrequent stress of much larger amount. All the stresses have been taken care of within the structure itself. Braces have been put at the proper places and no guy lines or other extraneous means of support are necessary. Neither are any buttresses now used such as were thought necessary with the steel derricks made years ago. When the derricks are firmly bolted to the base, they will withstand extremely nigh winds, and the chances are that should they blow over, they will blow over in one piece.

Gusset plates, diagonal braces and other small members have a minimum thickness of ¼". No material of less thickness than ¼" is used except for fillers. The thickness of angles and plates used for braces and for details of the machinery supports is ⅜", except where increased thickness is necessary to provide proper bearing for the shafts.

The theoretical safe loads which these derricks will sustain vary of course with their size and height. The 55-foot Woodworth Oklahoma will carry 56,000 pounds safely, while the 80-foot Standard will carry 90,000 pounds. The load over the crown pulley is made up, as is well known, of the load of casing, tools, etc., plus the equivalent downward pull on the drilling cable, and in consequence the loads which the derrick has to sustain are twice what come on the drilling cable. It is obvious that if the entire pull in drawing casing, for example, comes on two legs, the derrick cannot be expected to stand its full theoretical load. While these represent the standard sizes and weights, the flexibility of the steel drilling rig is seen in the fact that any desired strength may be obtained simply by increasing the thickness of the members.

Experience in Use.

Quite a number of derricks and drilling rigs have already been placed in active operation, a sufficient number to justify drawing conclusions as to their advantages based not on theoretical considerations, but on actual experience in their use.

1. Exactness of Alignment: In a separate pamphlet which has been issued by the inventor of the Yorke all steel derrick the statement is made that "the steel foundation is truly a masterpiece, because when the bolts are tight, the thing is square, and all that is necessary is just to pinch it around until it is in line with the main sill, making sure all the time to have good, wide, solid blocking under corners and centers, too." As is well known, steel work is cut very exactly at the shops. The connections are put on with such squareness that the whole thing is either all wrong or else very much all right; that is to say, if the structure goes together at all, it will go together with a precision not possible in wooden construction, and with this precision the question of alignment does not cut much figure in the actual erection of a derrick. If the sills are level, the structure will go together correctly and will be plumb and square without any particular attention on the part of the rig builder to make it so and simply for the reason that it has been made so in the shop. In the wooden rig it is necessary for the band wheel, for example, to be keyed on to the shaft so that it can be moved backwards and forwards along the shaft in order to bring it into exact alignment with the band wheel, sand reel, etc. With the steel rig everything comes to its proper place and the wheel, if desired, could be keyed directly to the shaft in the shop before shipment. The same consideration applies to the other parts of the operating mechanism, so that while it can be truly said that with the wooden rig it is a hard matter to get the thing level and in alignment, with the steel rig it can be just as truly said that it is a hard matter to put it together any other way.

2. Smoothness of Operation: The necessary consequence of this precision of manufacture is seen in the smoothness with which all parts of the mechanism work. The structure is stiff and rigid. It does not give like a wooden rig and in consequence there is no lost motion in operation. The boilers furnished for drilling purposes are usually figured for a steam pressure of 110 pounds per square inch. With the lost motion in a wooden rig, inequalities in foundation and other elements consequent upon the use of crude structures and equipment these boilers are often overloaded to 125 or 130 pounds pressure. Wells 3,600 feet deep have been drilled with the Woodworth Standard drilling rig on 80 pounds pressure. The difference between the two is due to the smoothness with which the band wheels, bull wheels, sand reels, crown pulleys, etc., work, and is an item of importance in considering the cost of a rig.

3. Re-use: The first cost of a steel derrick or steel drilling rig may be quite a good deal higher than that of a wooden derrick or wooden drilling rig, but it represents an investment of indefinite use and practical indestructibility. Assuming that a wooden rig may be used to drill two wells and that a steel rig may only be used to drill four or five, then even on this low basis, capitalized at the usual rate of interest, the investment in a steel drilling rig will yield larger returns by reason of its small cost of maintenance and its durability. As a matter of fact, some of the steel rigs have drilled six wells apiece running from 2,200 to 3,800 feet deep and are just as good as the day they were built.

Objections to Steel Derrick.

The objections which have been raised against the use of the steel derrick are theoretical and have all been met in actual experience. It is natural that the rig builder should prefer wood, but valid objections should be based on considerations other than those of individual preference. Dawson in his pamphlet on Well Drilling Methods calls attention to two criticisms against the steel derrick which he considers valid; first, the delay and expense in getting repairs from the supply houses for parts which may be bent or broken, and second, the use of bolts. Neither of these objections are truly valid.

The first objection is not valid for the reason that steel is not likely to be broken by any possible calamity which may happen to it, and if bent, it is very easily straightened at the driller's own forge. Moreover, so far as the types of derricks discussed in this paper are concerned, they are carried in stock and any piece may be obtained very quickly, so that as at present manufactured the steel derrick is as much a stock proposition as almost any other part of the drilling rig. It may be said, however, that in the nine years that the speaker has been connected with this industry he has never had to replace a part for either of the reasons stated.

So far as the use of bolts is concerned, the drillers were afraid that they would work loose and drop on their heads while operating, and, therefore, Mr. Dawson suggested the use of jamb nuts. Other people have suggested the use of square shouldered or elliptical bolts with nut locks, and again others have suggested that a cotter pin be used in each bolt. In the speaker's experience there has never been a bolt which came loose in the drilling rig under the ordinary operations of drilling, and he is very firmly persuaded that the ordinary round machine bolt with a carefully cut thread is all that is necessary. As a matter of fact, very soon after the bolts are put in position the slight film of rust which forms on them makes a very effective lock, and the criticisms which come to him are not that the bolts work loose, but that when the derricks are taken down, the bolts are hard to loosen.

The future of the steel derrick seems well assured and the utmost economy in the drilling of wells for gas at least by the cable system will be found in the use of the structural steel rig, rigid and steady when erected and easily dismantled and re-erected by the use of bolts, and, therefore, made both permanent and portable.

President Garard: Gentlemen, you have heard Mr. Woodworth's paper, which has been a very interesting one. If you have any questions to ask him I know he will be glad to answer them; or if there are any comments we would be glad to have a discussion of the paper at this time.

In view of the fact that no one seems to have any questions to ask him and no one has any comment to make upon the paper, it is evident that his discussion of the subject has been so comprehensive and so lucid that there is nothing left to discuss or to question.

M. M. Sweetman: Mr. President, I move that a vote of thanks be tendered to Mr. Woodworth for this valuable paper, and the convention show its appreciation of the honor by a rising vote.

E. D. Leland: I second the motion.

The above motion; having been duly seconded, was then unanimously adopted by a rising vote.

President Garard: The next order of business is the report of the committee on next place of meeting.

Mr. M. W. Walsh then submitted the following report of the committee on next place of meeting:

To the Natural Gas Convention of America:

Your committee on location of the next annual convention begs to submit the following report:

That the seventh annual convention of the Natural Gas Association of America be held next May, at Kansas City, Mo.

(Signed) F. W. MINER,
M. W. WALSH,
A. G. HOLMES.

M. W. Walsh: I move the adoption of the report.

M. M. Sweetman: I second the motion.

The above motion, being duly seconded, was then unanimously adopted, amid applause.

President Garard: The next regular order of business is the report of the committee on president's address.

Mr. J. C. McDowell then submitted the following report of committee on president's address:

To the Members of the Natural Gas Association of America:

Your committee on the president's address desires to express its high appreciation and commendation for the subject matter treated in this valuable report. It desires to express its pleasure that the high fuel value of natural gas is being more appreciated, and to observe the commendable steps taken by the leading natural gas companies to conserve it from useless waste. Your committee recognizes that every move to prevent waste in this direction means longer continuance of the many advantages resulting from the use of natural gas, renders more stable and permanent the millions of dollars already invested in its production and distribution and makes more inviting the many opportunities for future successful investments of this character.

Appreciating the wisdom which led our esteemed president to prevent agitation when certain legal questions were under consideration during the past year, your committee rejoices with the other members of this association over the decision rendered this week by the United States Supreme Court, settling forever the disputed question as to whether a state can shut up its wealth within itself or will allow the opportunity to waiting capital to develop and transport its resources and especially natural gas to the distant market in another state where the same is more apreciated.

Therefore, in conclusion, your committee desires to call the attention of

the president of this association to the fitting opportunity which now exists for the appointment of a permanent committee to energetically and persistently develop public sentiment, initiate and promote legislation and encourage the enforcement of existing laws for the conservation of natural gas.

(Signed)

J. C. McDOWELL,
W. H. McKENZIE,
F. L. CHASE,
Committee.

Secretary Jones: I move the acceptance and adoption of the report.

W. M. Welch: I second the motion.

A. B. Macbeth: Gentlemen, you have heard the motion. Is there any discussion?

The above motion, having been duly seconded, was then unanimously adopted.

M. M. Sweetman: Mr. President, in view of the adoption of the resolution for the appointment of a permanent committee to energetically and persistently develop public sentiment, initiate and promote legislation and encourage the enforcement of existing laws for the conservation of natural gas, and in view of the amount of labor that this committee will be required to perform, I move that an appropriation be made for the use of this committee of $500 out of the treasury of the association, so that the committee may use any part that will be necessary to carry on this work for the coming year. Mr. McDowell stated that there were millions of dollars invested in the natural gas industries of the country; and I want to add that this association represents practically every dollar of that investment. Therefore, the importance of the work which this committee is to perform is made apparent; and I think the least we could do would be to appropriate this money for the purpose of protecting that investment.

W. M. Welch: I second the motion.

The above motion, being duly seconded, was unanimously adopted.

President Garard: Gentlemen, in accordance with the report submitted by the chairman of this committee, I take great pleasure in appointing the members to constitute the conservation committee. In the appointment of this committee I have tried to cover as much territory with this committee as possible. I have also taken into consideration the capabilities of the men named. I have conferred with quite a number of our members, and I now announce the following:

Committee on Conservation.

J. C. McDowell, of Pittsburg, Pa., chairman. (Applause.)

Professor I. C. White, of Morgantown, W. Va. (Applause.)

P. W. Lupher, of Columbus, Ohio. (More applause.)

Louis C. Dennig, St. Louis, Mo. (More applause.)

(Now, you Wild Western bunch, get ready to yell.)

Archie Leonard, of Tulsa, Okla. (Continued applause.)

Now, I hope this committee will meet with the approval of everybody. We have tried to select it with due care.

In connection with the research committee which I was requested to appoint, I beg to submit the following:

Research Committee.

Professor W. T. Magruder, of the Ohio State University, Columbus, Ohio, chairman.

Frank L. Chase, president of The Central Contract and Finance Company, Columbus, Ohio.

Alfred H. Hurlburt, engineer, Kansas City, Mo.

President Garard: The next order of business will be the report of the memorial committee, of which Mr. William McNair Welch is the chairman.

Mr. William McNair Welch then submitted the following report of the committee on memorials:

To the Natural Gas Association of America:

Gentlemen—We have to chronicle the death since the last meeting of the Natural Gas Association of America of three members—Edward S. Springer of Leavenworth, Kas.; J. D. S. Neely of Lima, Ohio, and Herbert L. Williams of Detroit, Mich.

Whereas, The Natural Gas Association of America assembled in convention, having learned of the sudden death of our esteemed friend and fellow-member, Edward S. Springer, of Leavenworth, Kas., whose untiring personal efforts both as a member and as a director of our association aided in a marked degree in its promotion and development; therefore be it

Resolved, That this Association hereby instructs its secretary to spread upon the minutes of its proceedings for permanent record its expression of deep loss in the death of Mr. Springer; and, be it further

Resolved, That a copy of this resolution be sent to the members of his family.

Whereas, on account of the many expressions of deep regret upon the death of our fellow-member, J. D. S. Neely, of Lima, Ohio, who was held in very high esteem by all of the members of this association, and whose co-operation and aid has been instrumental in advancing the interests of the association since its inception; therefore, be it

Resolved, That this association hereby instructs its secretary to spread upon the minutes of its proceedings for permanent record its expression of deep loss in the untimely death of Mr. Neely; and, be it further

Resolved, That a copy of this resolution be sent to the members of his family.

Whereas, The death of Herbert L. Williams, of Detroit, Mich., has been learned with regret, and,

Whereas, Our fellow-member was held in the highest regard by the members of this association; therefore, be it

Resolved, That this association hereby instruct its secretary to spread upon the minutes of its proceedings for permanent record its expression of deep loss in the death of Mr. Williams; and be it further

Resolved, That a copy of this resolution be sent to the members of his family.

Respectfully submitted,

(Signed)
WM. M. WELCH, Chairman;
JAMES T. LYNN,
GEORGE BARROWS,
Committee.

It was then moved by W. M. Welch, seconded by James T. Lynn, and unanimously carried by a rising vote, that the report of the committee on memorials be accepted and spread upon the minutes.

President Garard: The next order of business is the election of officers. We are now ready for the report of the nominating committee, of which Mr. Sweetman is chairman.

Mr. M. M. Sweetman, as chairman, then submitted the following report of committee on nominations:

Mr. President, and Gentlemen:

Your committee on nominations begs leave to submit the following list of names for the respective offices indicated, and recommend their election thereto:

President, Mr. Alexander Barksdale Macbeth, of Independence, Kas. (Applause.)

Vice-President, Mr. Martin B. Daly, of Cleveland, Ohio. (Applause.)

Secretary and Treasurer, Mr. Thomas Clive Jones, of Delaware, Ohio. (More applause.)

Director of the eastern portion of the United States, Mr. Alan Leamy, of Columbus, Ohio.

Director of the western portion of the United States, Mr. M. W. Walsh, of Oklahoma City, Okla. (Great applause.)

President Garard: Gentlemen, the nominees will be kind enough to rise; those who are here. Some of them are not here, I know. Mr. Leamy had to go last night.

W. M. Welch: I move the adoption of the report of the committee on nominations.

Several Voices: I second the motion.

The report of the committee on nominations was then duly adopted by a rising vote.

President Garard: Gentlemen, I now declare you one and all elected to the offices to which you have been nominated by the report of the committee on nominations.

Mr. J. C. McDowell: Mr. President, if it is in order, I have a resolution I would like to present.

I am sure I voice the sentiment of the association when I say that in a very large measure its success is due to the indefatigable efforts and painstaking care of our secretary, Mr. Thomas Clive Jones.

The growth of the association has greatly increased the work of the secretary; and the compensation is now too small for the service rendered, and should be increased; and while I realize that any compensation the association can afford would not of itself induce Mr. Jones to accept the secretaryship, I move that he be paid $1,000 for the coming year for the work—with the love of all the boys thrown in as the principal incentive for undertaking it. (Applause.)

Several Voices: I second the motion.

President Garard: Gentlemen, I am aware of the amount of work Mr. Jones has done in the past two years. We live not far apart, so that I know what is going on most of the time. He has done a great deal of work; and the last two months preceding the convention he has devoted practically his en-

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MEXICAN OIL—52 operating companies, greatest strikes ever made in any part of the world, greatest oil bearing area ever developed. Your opportunity; 11 American colonies, contented and prosperous. Send $1 for a year's subscription and keep track of developments on the east coast. Oil, lands, products, resources.—TIMES, Tampico, Mexico.

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OFFICE MAN—Position by experienced executive office man, familiar with oil and gas business. References given. Address Secretary, care The Journal.

FIELD MANAGER—A man who knows how to manage an oil field or company is loking for an opportunity with a new company, where the compensation will consist of small salary and an interest in the concern, or half cash salary and one-half in stock. Would not object to going abroad, and have had years of experience in Spanish-speaking countries. Best of references. Address, M. U. L., care of Oil & Gas Journal, Drawer 22, St. Louis, Mo.

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tire time to the work connected with his position as secretary and treasurer of this association. It is useless for me to speak of the results that he has obtained, because they have been shown here in the successful meeting we have had the last three days. I take pleasure in knowing that this resolution has been offered in the way it has, and has been seconded by a number of members.

The above resolution, having been duly seconded, was then unanimously adopted.

Voices: Jones! Jones! Speech! Speech!

Secretary Jones: Gentlemen, I very much appreciate the resolution and the action of the association in its adoption. I may say when I came to Pittsburg this time it was with the avowed intention of relinquishing the duties of secretary and treasurer, which I have found to be engrossing, and as the association grows requiring more time each year. However, no one could help but appreciate the good feeling and cordiality with which my efforts have been received by you; and for the action which you have just taken in the adoption of the resolution submitted. I can only say that I thank you for your appreciation, and hope we will all do all we can to make the next meeting of the association at Kansas City a great success. (Applause.)

President Garard: Gentlemen, I want to thank each and all of the members for your kindness to me during the past year. I do not think the membership of any organization was ever more loyal than the membership of the Natural Gas Association of America has been to its president. I thank you sincerely from the bottom of my heart, each and every one of you; and I step down into the ranks I hope with the best wishes of each member of the association. Next year I will be at Kansas City working in the ranks just as hard as any of the rest of you for the success of our association. (Applause.)

It now gives me great pleasure to present to you your incoming president, Mr. Alexander B. Macbeth.

M. M. Sweetman: The chairman of the committee on nominations will escort Mr. Macbeth to the president's chair.

At this point Mr. A. B. Macbeth was escorted to the platform and assumed the president's chair.

J. M. Garard: Gentlemen, I take pleasure in presenting to you your new president, Mr. Macbeth. All I ask for Mr. Macbeth is that he may receive as loyal support as you have given me; and if he does we will have another one of the greatest conventions that was ever held in the state of Kansas. (Applause.)

President Macbeth: I first want to thank the retiring president for his very cordial introduction; and, gentlemen and fellow-members, I wish then to thank every one of you for the honor which you have just conferred upon me. I realize the responsibility which accompanies it. The previous officers of this association have established a record which it will be hard for me to equal; but with the assistance of our worthy secretary, whom we all know has done such wonderful work in the past, I hope we may be able to continue the high standard of efficiency which has been demonstrated by the past. It would be foolish, however, for Mr. Jones and myself and the other officers recently elected to think that we could carry on the work of this association alone. I now wish to appeal to every one—the members from the east and the members from the west, the younger members, and the older members—if there are any old members, and also the members who are not very old, but who are old in experience, to assist us in making the next meeting at Kansas City even better than the one we have had at Pittsburg.

Gentlemen, we need the advice of every one of you, and I hope that you one and all will accord to the new officers the loyal support that you have accorded our retiring president and the other retiring officers. I hope that as any matter comes to your mind during the course of the next year which would add to the interest of our next meeting you will immediately communicate with either the secretary or myself, in order that the next convention will be even a greater success than this one. (Applause.)

Several Voices: Daly! Daly! Speech! Speech!

Vice-President Martin B. Daly, of Cleveland, Ohio: Mr. President, and gentlemen—Unfortunately I was not able to join you in the early part of the week; but judging from the enthusiasm and the reports that I have heard here incidentally this morning, this meeting has been of great benefit to all. Naturally, such meetings must result in benefit to the different interests they advocate.

There is one subject to which I would advert for a moment, and that is with reference to our treatment of the public. I do not believe any organization can afford to attempt to fool the public. You want to take them into your confidence. That is what this organization is for. Through a system of muckraking we have come to the point where the public distrusts us; they feel that they are being abused to some extent. I believe that has been due very largely to the fact that the men who represent these great institutions have not had the time to mingle with the public and have not taken the pains to present their side of the case, although they all have the ability to do so; but they have left it to more inexperienced hands, and to persons who have had thier own selfish purposes to subserve.

I appreciate very highly the compliment which you have paid me here today by electing me as your vice-president. Any man who would say that he does not appreciate such a compliment coming from such a body of men would certainly not have the right feeling toward the fellow-members of a kindred occupation.

As we get along toward the summit of the bill, and as we look back on the past, after all about the best thing we have achieved is the confidence and esteem of our fellow-men, no matter what other successes we may have.

I assure you that I appreciate your kind compliment to me in the fullest, and again thank you for it. (More applause.)

Voices: Walsh! Walsh! the badger fighter.

M. W. Walsh: Mr. President and gentlemen—I wish to thank you for the honor you have bestowed upon me today, and I certainly will do all I can to aid in the success of the association. I thank you. (Applause.)

President Macbeth: The next order of business is the report of the committee on final resolutions, of which Mr. W. B. Jackson, of Columbus, Ohio, is chairman.

Mr. W. B. Jackson, of Columbus, Ohio, then read the following report of committee on final resolutions:

Whereas, After three days of mingled work and play the sixth annual convention of the Natural Gas Association of America has now reached the hour of its adjournment, and the delegates, somewhat tired but happy, are about to depart for their homes, this committee finds, after a general survey of the situation, that there is unanimous accord in the sentiment that the convention now closing has set a high mark for future gatherings in both its material and entertaining features.

Therefore, be it resolved, That we are highly appreciative of the work done by the officers of the association and the members of the various standing committees. We congratulate the members of the association on the progress made during the last year under the executive direction of President John Mesmore Garard, who has given most liberally of his time to the work of the association; also for the untiring work of our efficient secretary, Thomas Clive Jones, and the fact that we will again have the benefit of his labors in this office for the coming year.

We congratulate the association on the handsome increase in its membership, over two hundred new members having been added to its rolls in the past year, and we extend the thanks of the association to the men who have aided in accomplishing this result, particularly Arthur Booth, of the Philadelphia Company, Pittsburg, who alone secured over sixty new members.

The thanks of the association are due to the city officials of Pittsburg, who so kindly welcomed our body to this great industrial center; to the newspapers, which have so carefully reported our proceedings; to the hundreds of Pittsburg citizens who have assisted in the entertainment of our delegates; to the H. J. Heinz Company, the Westinghouse interests and the National Tube Company for the opportunity afforded of a complete inspection of these great industrial concerns.

We congratulate the association on the extensive display of appliances of the natural gas industry, and trust that the exhibitors who have assisted in making this show such a success will secure adequate results from their participation in an exhibit which shows the progress made in the utilization of natural gas.

The thanks of the association are most sincerely tendered to the members of the local executive committee and their associates in its work. David O. Holbrook, of the Dayton Coupling Company, as chairman in general charge; A. G. Holmes, of the Pittsburg Meter Company; F. W. Miner, of the National Supply Company; Howell Van Blarcom and Justin R. Lurff, of the Westinghouse Machine Company, as members of the executive committee, were untiring in their efforts and the result of their labors is apparent in the magnificent display in the exhibit hall and the elaborate entertainment which has been afforded the delegates and visitors to the convention.

Respectfully submitted,
W. B. JACKSON,
F. W. STONE,
W. D. O'NEILL.

W. B. Jackson: Mr. Chairman, I move the adoption of the report.

M. M. Sweetman: I second the motion.

The report of the committee on final resolutions was then unanimously adopted.

On motion of E. D. Leland, duly seconded by W. D. O'Neill, and carried, the sixth annual meeting of the Natural Gas Association of America then adjourned sine die.

USING MISSOURI GAS.

Rich Hill, a town of 3,000 people in Bates county, is the only Missouri town which is using Missouri gas for light and heat. The Bates County Gas Company has seven wells, drilled to 330 feet with a rock pressure of 85 pounds. The line will shortly be extended to Hume and residents of Butler, the county seat, have been importuning the company to come their way. It is hardly likely that this will be done, as the company is paying well under present circumstances. Everybody appears to be satisfied, and trouble might follow too rapid growth of the system.

FULLER'S EARTH.

Statistics on the production of fuller's earth in 1910, as compiled by Jefferson Middleton, United States geological survey:

The fuller's earth resources of the United States have attracted considerable attention for several years because of the increasing demand for this material for use as a clarifying agent for mineral and vegetable oils. The original use from which it derives its name, the fulling of cloth, is now a minor one.

Chemically it is a clay, high in combined water; in color it ranges from gray to dark green; when dry it often adheres to the tongue, though this quality is found in some other clays. A chemical analysis is of little value in determining the value of clay as fuller's earth; the actual use is the only criterion.

Occurrence.

Fuller's earth occurs in Alabama, Arkansas, California, Colorado, Florida, Georgia, Massachusetts, Nebraska, New York, South Carolina, South Dakota, Texas, Utah and Virginia, though it was produced in 1910 in but eight states, the six reporting no production being Alabama, Nebraska, New York, South Dakota, Utah and Virginia.

Mining and Preparation.

In this country fuller's earth is mined with pick and shovel. When mined it contains more or less water and is dried either in the sun or by artificial means. After being dried it is ground to 60 mesh or finer and is then ready for shipment. In England the earth is washed in long, narrow troughs very much like hydraulic sluice boxes, a large percentage of the material being allowed to settle out as sand, while the lighter material goes off into settling tanks, where it is dried; it is then sold in the resulting lump form.

Uses.

As already mentioned, the principal use of fuller's earth in this country is the bleaching, clarifying, or filtering of fats, greases, and oils. The common practice with mineral oils is to dry the earth carefully, after it has which the crude black mineral oils are allowed to percolate very slowly. As been ground to 60 mesh or finer, and run it into long cylinders, through a result, the oil that first comes out is perfectly water white and much thinner than that which follows. The oil is allowed to continue percolating through the earth until the color reaches a certain maximum shade.

With the vegetable oils, the process is radically different. The oil is heated beyond the boiling point of water in large tanks; from 5 to 10 per cent of its weight of fuller's earth is then added, and the mixture is vigorously stirred and then filtered off through bag filters. The coloring matter remains with the earth, the filtered oil being of a very pale straw color, provided the operation has been conducted with sufficient care.

History.

For a great many years fuller's earth, as its name indicates, was used for fulling cloth, and until 1893 it was imported for this purpose from England, the then only known source of supply. With the growth of the domestic vegetable-oil industry a demand arose for a clarifying agent and fuller's earth was used extensively, whereas for filtering mineral oils bone black was used. Upon the discovery of fuller's earth in this country it superseded bone black as a detergent for mineral oils. From the first it was found that the American earths were better adapted for use on mineral oils, and the English earths were better for fats and vegetable oils. In clarifying vegetable and animal fats with American earths a more or less disagreeable taste is left. Just why this is has never been determined.

The discovery of fuller's earth in this country in 1893 was by accident. At Quincy, Fla., an effort which proved a failure was made to burn brick on the property of the Owl Cigar Company. An Alsatian cigar maker employed by the company called attention to the close resemblance of this clay to the German fuller's earth. As a result of this suggestion, the clay was tested and was found to be fuller's earth, and the industry was developed. In consequence of this discovery there was considerable excitement, and supposed deposits of fuller's earth were reported from a number of states. As usual, the material in the most of these deposits was found to be of no value as fuller's earth.

Since the discovery of fuller's earth in 1893, Florida has been the leading producing state. During the early history of the industry the production was from only two or three states. In 1897-1899 it was reported from Florida, Colorado, and New York, with a very small production from Utah; in 1901 Arkansas was added to the list. From 1904 to 1907 Arkansas was the second largest producer. Fuller's earth was found in Georgia soon after its discovery in Florida, but Georgia did not appear as a producer until 1907, when it was the third largest producing state; it ranked second in 1909 and 1910. In 1904 Alabama and Massachusetts reported production, in 1907 South Carolina and Texas first appeared, and in 1909 California entered the list.

Imports.

The following table shows the imports of fuller's earth from 1897 to 1910, inclusive:

	Unwrought or unmanufactured			Wrought or manufactured			Total	
Year	Quantity	Value	Average price per ton	Quantity	Value	Average price per ton	Quantity	Value
1897‡	2,585	$14,283	$5.53	2,395	$20,037	$8.37	4,980	$34,320
1898	2,283	15,921	6.97	7,073	55,123	7.79	9,356	71,044
1899	4,192	23,194	5.53	7,366	46,446	6.31	11,558	69,640
1900	2,723	14,750	5.42	6,431	50,047	7.78	9,154	64,797
1901	3,266	17,230	5.28	8,792	63,467	7.22	12,058	80,697
1902	4,239	26,635	6.28	10,895	75,945	6.97	15,134	102,580
1903	4,260	28,339	6.65	12,840	92,332	7.19	17,100	120,671
1904	1,975	9,546	4.83	8,247	64,460	7.82	10,222	74,006
1905	1,705	12,798	7.51	12,858	93,199	7.25	14,563	105,997
1906	2,905	20,129	6.93	11,920	88,566	7.43	14,825	108,695
1907	2,490	16,833	6.76	13,916	106,398	7.57	16,406	122,231
1908	2,363	16,242	6.87	9,803	77,171	7.87	12,166	93,413
1909	1,802	12,492	6.93	10,950	88,659	8.10	12,752	101,151
1910	2,160	14,399	6.67	14,427	118,146	8.19	16,857	132,545

‡July to December.

Production.

The following table shows the production of fuller's earth in the United States from the inception of the industry:

Production of fuller's earth in the United States, 1895-1910, in short tons:

Year	Quantity	Value	Average price per ton
1895	6,900	$41,400	$6.00
1896	9,872	59,360	6.01
1897	17,113	112,272	6.56
1898	14,860	106,500	7.17
1899	12,381	79,644	6.43
1900	9,698	67,535	6.96
1901	14,112	96,835	6.86
1902	11,492	98,144	8.54
1903	20,693	190,277	9.20
1904	29,480	168,500	5.72
1905	25,178	214,497	8.52
1906	32,040	265,400	8.28
1907	32,851	291,773	8.88
1908	29,714	278,367	9.37
1909	33,486	301,604	9.01
1910	32,822	293,709	8.95

This table shows that in 1910 the production decreased 664 short tons, a loss of 1.98 per cent in quantity and of $7,895, or 2.62 per cent, in value. The maximum output and value were in 1909, being 33,486 tons, valued at $301,604. The highest average price per ton was $9.37 in 1908 and the lowest was $5.72 in 1904.

The following table shows the production of fuller's earth in 1910, by states:

Production of fuller's earth in the United States in 1910, by States, in short tons.

State	Number of operating producers reporting	Quantity	Value	Average price per Ton
Arkansas	4	2,563	$29,137	$11.37
California & Colorado	3	568	8,085	.....
Florida	3	18,832	170,267	9.04
Georgia, Massachusetts and South Carolina	4	9,995	77,638	.....
Texas	3	864	8,582	9.93
Total	17	32,822	$293,709	$8.95

This table shows that Florida was the leading producing state in 1910, and reported 57.38 per cent of the quantity, and 57.97 per cent of the value of the total production. The other states in the order of their rank in output and value in 1910 were as follows: Georgia, Arkansas, Texas, California, Massachusetts, South Carolina, and Colorado. The average price per ton in the states combined in the table was as follows: California, $15.79; Colorado, $9.93; Georgia, $7.79; Massachusetts, $7.14; South Carolina, $8.00.

In the following table is shown the quantity and value of the fuller's earth imported from 1867 to 1883, by fiscal years. The wrought and unwrought were not classified separately during this period. From July 1, 1883, to June 30, 1897, fuller's earth was not reported separately in the customhouse returns to the treasury department, but was included under minerals "not elsewhere specified."

Imports of fuller's earth into the United States, 1867-1883, in short tons:

Year ending June 30—	Quantity	Value
1867	314	$3,113
1868	236	2,522
1869	363	3,587
1870	268	2,619
1871	325	3,383
1872	307	3,358
1873	281	2,978
1874	310	3,440
1875	336	3,694
1876	277	3,097
1877	448	4,460
1878	375	4,095
1879	404	4,269
1880	647	6,925
1881	300	3,207
1882	1,017	11,444
1883	1,390	14,309

Fuller's Earth in Texas.

Bulletin 470, "Contributions to Economic Geology, 1910," part 1, contains "Notes on some clays from Texas," by Alexander Deussen, who describes eight deposits of fuller's earth. Tests to determine the value of these clays as fuller's earth are in progress, but at this time the results are not available. The following is an abstract of the portion of the paper relating to fuller's earth:

This plant and pit are located three miles north of Somerville, Burleson county, one mile west of the Gulf, Colorado & Santa Fe Railway. In the pit is exposed 12 feet of brown fuller's earth, which dips beneath hard, gray sandstones about 200 feet from this point. The deposit is about 50 acres in extent. Over most of this area the clay is covered with overburden varying in thickness from 3 to 10 feet and consisting in some places of soil and gravel and in others of soil and gravel and sandstone.

The fuller's earth is a fine-textured, compact, even-grained, hard brown clay. Joint and fracture planes are numerous, and along these planes and the lamination planes there is a slight coating of limonite, which has been deposited by water. Occasional nodules of pyrite, averaging three-fourths of an inch in diameter, are also present. Lignite from Milano and Rockdale and cordwood from the vicinity of the deposit are available for fuel. Good water can be had from wells less than 500 feet deep, and natural drainage keeps the pit free from water.

This deposit was worked for a short time in 1909 and 1910, but the enterprise did not prove a success. The earth was dried and ground to 80 to 200 mesh. The fineness of the material is ascribed as one of the causes for the failure of the enterprise; and the long haul by wagon as another. The clay was dug with pick and shovel.

The plant of this company is located seven miles north of Burton, the nearest shipping point, on the David Heirs League, in Washington county. A small quantity of fuller's earth was shipped from this plant in 1909, but the business was not successful. The deposit consists of soft brown fuller's earth and covers about 250 acres. There are two strata here, one 4 feet thick, 10 feet from the surface, and another 5 feet thick separated from the first by 6 inches of lignitic shale. The first mentioned stratum is the one that has been worked. The average thickness of the overburden is 6 feet. The distance from the railroad, seven miles, was one of the principal causes of the failure of the business; another reason being the cost of working under a 6-foot overburden.

Five miles south of West Point, on lot No. 84, W. F. Hamilton League, in Fayette county, on the property of J. C. Melcher, of O'Quinn, occurs a deposit of fuller's earth, varying in thickness from 6 to 16 feet, covered with an overburden from 2 to 10 feet in thickness. This earth is exposed in the banks of a small hollow, showing a section 16 feet thick, very uniform in physical and chemical composition. At this point it is overlain by 2 feet of gravel that could be utilized for ballast. This point seems favorable for the location of a plant on account of the facilities for shipment—the railroad being but half a mile distant—the little overburden, the thickness of the bed, the natural drainage facilities and abundant fuel.

The earth is light brown of very fine texture. A thin film or coating of limonite pervades the joint and lamination planes.

On the farm of J. C. Murray, three miles north of Lyons, in Burleson county, occurs a hard blue shale that may tentatively be classed as fuller's earth. It consists of a compact blue shale of uniform chemical and physical composition 5 feet thick. A number of shafts have been sunk which show that the deposit covers about 40 acres, but the material is probably available under from 70 to 80 acres. The overburden is from 2 to 10 feet thick. The main line of the Gulf, Colorado & Santa Fe Railway crosses this farm, so that shipping facilities would be good. Tests showed that this clay is unsuitable for the manufacture of clay products.

On the farm of Paul Taylor, 1 1-2 miles northwest of Somerville, in Burleson county, occurs an extensive deposit of compact, brown, leaf-bearing shale that may be tentatively classed as fuller's earth. This deposit lies directly on top of the gray sandstones described as overlying the clay at the Somerville Fuller's Earth Company's plant. It is here exposed on a branch of Yegua creek, and shows a thickness of 13.2 feet with an overburden 6.8 feet thick. It is a compact, fine-grained, even-textured clay of uniform chemical and physical composition over a large area. It is situated 500 yards west of the main line of the Gulf, Colorado & Santa Fe Railway and could easily be reached by a spur. Natural drainage is good for any pits that might be opened. Tests made by Frank Graves, of Burton, are said to have shown that the earth possesses high bleaching and decolorizing power. Tests showed that it is not suitable for the manufacture of clay products.

The deposit is located 7 1-2 miles from Burton, the nearest railroad point, a distance which for the present, at least, makes this clay unavailable. Tests of the bleaching power of this

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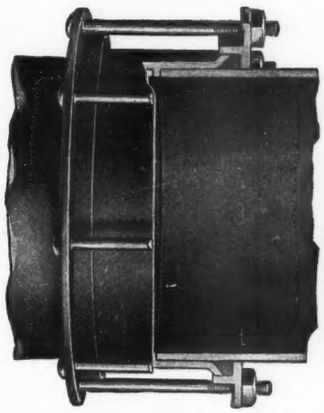

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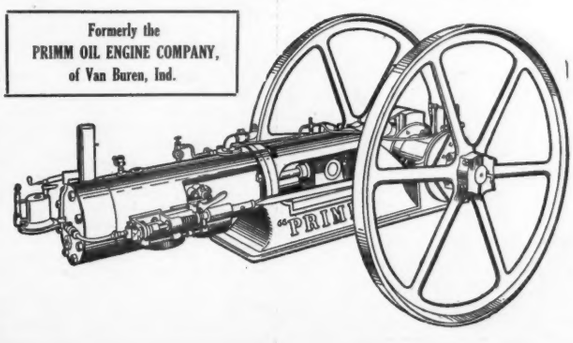

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THURSDAY, JUNE 22, 1911

Quotations on Credit Balances as Posted by the Pipe Lines.

Kansas and Oklahoma.

Prairie O. & G. Co., all grades	.48
Gulf Pipe Line Company	.48
The Texas Company	.48

Caddo.

40° and above	.60
Under 40°	.55

North Texas.

Corsicana, light	.53
Corsicana, heavy	.53
Henrietta	.53

Southeast Texas.

Spindletop	.72
Sour Lake	.67
Batson	.67
Saratoga	.67
Humble	.67
Dayton	.67

Eastern States.

Pennsylvania	$1.30
Corning	.77
Mercer County Black Oil	.87
New Castle	.84
Cabell	.94
North Lima	.82
South Lima	.77
Indiana	.77
Illinois, 30 degrees and above	.63
Illinois, under 30 degrees	.55
Princeton, Ind.	.60
Somerset	.72
Ragland	.45
Canada	1.24

California.

At wells	.30
Delivered, bay points	.70

PIPE LINE STATISTICS.

The following table shows the runs and shipments by the various lines in the oil fields of New York, Pennsylvania, West Virginia, Kentucky, Tennessee, Ohio and Indiana:

Runs June 1 to 17, Inclusive.

National Transit Co.	158,187
South West Pa. Lines	73,513
Eureka P. L. Co.	475,504
Buckeye P. L. Co.	312,724
Cumberland P. L. Co.	22,910
Indiana P. L. Co.	49,973
New York Transit Co.	7,788
Southern P. L. Co.	.....
Crescent P. L. Co.	.....
Tidewater Pipe Line (Pa. Oil)	58,802
Tidewater Pipe Line (Ill. Oil)	69,776
Ohio Oil Co. Ill. Oil	1,049,372
Total	2,228,549
Average runs	131,091

Shipments June 1 to 18, Inclusive.

National Transit Co.	961,957
South West Pa. Lines	91,633
Eureka P. L. Co.	30,279
Buckeye P. L. Co.	166,643
Cumberland P. L. Co.	6,563
Indiana P. L. Co.	522,651
New York Transit Co.	744,706
Southern P. L. Co.	323,517
Crescent P. L. Co.	92,518
Tidewater Pipe Line (Pa. Oil)	193,378
Ohio Oil Co. Ill. Oil	463,231
Total	3,597,076
Average shipments	199,837

The Prairie Oil & Gas Company.

Net runs and deliveries from June 1, 1911, to June 14, 1911, both dates inclusive:

	Total barrels	Daily average
Runs	1,223,936.67	87,424.05
Deliveries	1,243,005.54	88,786.11
Taken out of tankage.	19,068.87	1,362.06

Runs and shipments for seven days ending June 14, 1911, by the Standard Oil Company, Division B, are as follows:

Field—	Bbls.
Kern River	16,469
Coalinga	113,755
Newhall	1,961
Santa Maria	1,416
Midway	237,816
Whittier	1,990
Total	373,411
Shipments	292,227
Surplus	81,184

clay made by Mr. Graves are said to have shown good results. Tests made by the survey show that it is well adapted to the manufacture of building brick.

On a branch of Turkey creek, about two miles east of Ledbetter, in Washington county, on the Burkhart land, occurs a deposit of brown shale or fuller's earth that is similar in general character and geologic relations to the clay of the Somerville Fuller's Earth Company. It is a soft, compact, even-grained, light brown shale or fuller's earth of uniform physical and mineralogical composition. Little can be said concerning the extent of this deposit, but it probably covers an extensive area, for it was encountered in putting down a shaft at the lignite mines, two miles west of the point of exposure. The overburden varies from 2 to 5 feet and consists chiefly of gravel and clay. This gravel, as indicated in connection with the description of other deposits, can be used as railroad bal- The gravel flat is covered with a heavy growth of post-oak timber, which constitutes an available source of fuel for this clay and in addition, a considerable body of lignite occurs beneath this clay. The deposit is only a mile from the railroad and could easily be reached by a spur. Tests show that this clay is not suitable for the manufacture of clay products.

NEW YORK EXPORT PETROLEUM MARKET

NEW YORK, June 15.—Developments in the market for petroleum and products have not been of an interesting nature. Aside from competition in markets abroad particularly in illuminating oil and a moderate decrease in orders for the week just ended, the close was nominally steady with official quotations unaltered. The decrease in sales was principally in refined illuminating oil and in gasoline, while a substantial gain in orders for naphtha and benzine is noted.

The demand for oil carriers to load full cargoes of case oil, shows no improvement and chartering has been quiet throughout the week just ended. The only fixture of importance was a large boat for a full cargo of case oil to two ports in China, for July loading at 22½c a case. Rates closed nominally steady. The total charters for petroleum, covering refined and products, etc., in bulk, barrels, cases, etc., for the week ended June 15, aggregated about 644,000 bbls., showing a shrinkage of some 37,000 bbls. compared with the total for the week preceding.

For the week just ended, orders for petroleum and products, as outlined in the review below are based on terms delivered vessel, free on board, New York or Philadelphia, covering 200-case lots and upward and 200-bbl. lots and upward, unless otherwise specified. Under a seasonable demand, orders for refined oil in bulk were fairly good and about equal to sales for the week preceding, booked at 3.75@4.75c per gallon for standard and water white oils, respectively, about 346,000 bbls., changing hands. There continues a good inquiry for refined in cases and sales embraced some 390,000 cases (each case containing two five-gallon cans, 110 fire-test oil) showing a falling off of about 100,000 cases, below sales for the week preceding. Of this amount full cargo lots compared about 325,000 cases, booked at 8.75@9.75c per gallon for standard and water white oils, respectively, while the balance, covering 3,000-case lots and upward, amounting to some 65,000 cases, changed hands at 8.90@9.90c per gallon for standard and water white oils, respectively. Increased activity in naphtha led to a substantial gain in orders, aggregating about 231,000 cases (mostly in bulk) booked at 12½c per gallon for 59@62°. Benzine also shared in the activity, fully 143,000 cases (mostly in bulk) changing hands at 21¼c for 73@76°; stove at 14¼c and auto 68@70° at 18¼c per gallon. Gasoline met with fairly good sales, involving about 22,000 cases at 23¼c for 86° per gallon. Orders for lubricating oils continued good, but a slight shrinkage compared with those for the week preceding is noted, with sales entered at former prices as to brand, fully 33,000 bbls. and 1,000 cases changing hands. In crude oil no transactions of importance could be traced, while of gas oil about 18,000 bbls. (oil in bulk) changed hands. In fuel oil no large orders have been booked.

Clearances of petroleum at the port of New York from January 1 to June 15, 1911, aggregated about 401,329,750 gallons, showing a gain of some 39,615,932 gallons compared with the total for the same time last year. Clearances at the port of Philadelphia from January 1 to June 15, 1911, amounted to about 150,520,000 gallons, showing an increase of some 24,207,000 gallons compared with the corresponding period in 1910.

Nothing of special interest has developed in the European petroleum markets and in the oil fields abroad, cable and mail advices noting a general quiet with prices, particularly of illuminating oil quoted wholly nominal for export, due to constant competition between American and foreign oil refiners. In the English markets trade continues seasonably quiet, particularly in illuminating oil, but prices of American and Russian refined closed nominally unchanged on contracts in the London and Liverpool markets. The situation in the Russian market has not changed to any extent. In the Baku market there continues a steady inquiry for fuel oil and under moderate stocks, prices closed firm with an upward tendency. Crude oil shows strength and higher prices are looked for during the navigation season which closes about October 1. At present, however, no large contracts are being booked, buyers having purchased sizable lines several weeks ago at lower prices which will meet their requirements in the near future. Competition in case oil is still hampering business and trade in bulk refined oil for export remains dull under light inquiries and higher prices asked. Quotations for crude oil, prompt delivery show a slight advance, while prices of refined have been lowered. In the Galician petroleum markets no changes of interest are reported. Prices of crued oil for prompt, shipment closed steady on a fairly good demand and moderate stocks. Negotiations by refiners who are endeavoring to arrive at an understanding to regulate prices on petroleum are not making much progress. The Roumanian market for petroleum remains unchanged with crude oil still firm owing to moderate supplies and producers showing little inclination to urge sales. Refined continues in seasonable demand but business is confined principally to withdrawals in outstanding contracts. English capital is being more freely invested in the Roumanian oil industry and new companies in London have been formed to develop and drill fields in Roumania as well as to operate refineries there.

The following table gives the charters for petroleum and products, in bulk, barrels, cases, etc., with daily averages, reduced to crude equivalent, compiled in barrels, for the week ended June 15 and since June 1, 1911:

June	Day	Since June 1	Average
9	150,952	888,974	98,775
10	31,968	920,942	92,094
12	40,159	961,101	80,092
13	119,049	1,080,150	83,088
14	123,859	1,204,009	86,001
15	177,620	1,381,629	92,109

The clearances of petroleum at the port of New York for the week ended June 15 and since January 1, 1911, compiled in gallons, with comparative figures, were as follows:

	Week	Since Jan. 1	Average
Refined	8,822,519	291,081,360	257,528,620
Crude	2,835,640	16,653,405	11,890,509
Naphtha	2,247,100	32,436,955	28,526,061
Resid'm	.....	82,500	11,396,723
Benzine	1,526,894	6,235,471	2,162,143
Gasoline	115,900	7,913,759	9,524,162
Lub. oils	825,486	45,278,486	39,506,998
Min. oils	11,250	1,647,814	1,178,602
Total	16,384,789	401,329,750	361,713,818

Foreign Closing Cable Quotations.

(American refined petroleum in barrels, standard white oil, ex-wharf.)

	London pence	Liverp'l pence	Antwerp francs	Bre'n marks
Fri.	5⅝@5½	5⅝@5½	18.75@19.00	6.00
Sat.	5⅝@5½	5⅝@5½	18.75@19.00	6.00
Mon.	5⅝@5½	5⅝@5½	18.75@19 00	6.00
Tues.	5⅝@5½	5⅝@5½	18.75@19.00	6.00
Wed	5⅝@5½	5⅝@5½	18.75@19.00	6.00
Thur.	5⅝@5½	5⅝@5½	18.75@19 00	6.00

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